



MLCFC 200-1200

Technical Service
Manual

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About This Manual

- **WARNING:** THIS MANUAL IS A SUPPLEMENT TO THE O & M MANUAL - ALL WARNINGS, INSTRUCTIONS, AND SAFETY PROCEDURES LISTED IN THE O & M MUST BE STRICTLY FOLLOWED. A COPY OF THE O & M MANUAL IS AVAILABLE AT <http://www.motivaircorp.com/literature>
- **WARNING:** THIS MANUAL IS A REFERENCE FOR QUALIFIED CHILLER REFRIGERATION TECHNICIANS ONLY.
- **WARNING:** THE PROCEDURES OUTLINED IN THIS MANUAL ARE SPECIFIC TO THE CHILLER MODELS LISTED. NO ATTEMPT IS MADE IN THIS MANUAL TO BE A COMPLETE OR EDUCATIONAL TEXT.
- **WARNING:** INDUSTRY STANDARDS FOR REFRIGERATION SERVICE AND REFRIGERANT HANDLING PRACTICES AS PRESCRIBED BY. THE FEDERAL CLEAN AIR ACT (SECTION 608), ARI, ACCA, EPA, OSHA, AND ANY LOCAL GOVERNING ORGANIZATION THAT HAS JURISDICTION MUST BE FOLLOWED. ALL TECHNICIANS WHO HANDLE REFRIGERANTS MUST BE CERTIFIED.
- **WARNING:** THIS MANUAL COVERS ONLY THE CHILLER MODELS MANUFACTURED PRIOR TO THE REVISION DATE – CONTACT MOTIVAIR FOR THE LATEST REVISION.
- **WARNING:** RECOMMENDATIONS AND REQUIREMENTS ARE STATED THROUGHOUT THIS MANUAL. THE REQUIRED REFERENCES ARE TO PRESERVE ANY WARRANTY STATUS.

MLCFC Sequence of Operation

Mechanical cooling – outlet control

On a call for cooling set point = 45°F glycol pump running flow switch closed the first stage compressor starts and runs at 25% loaded for 30 second then stages up to 50% at this point the control reads the outlet temperature if the temperature is within 1.8°F of set point the compressor holds at the present stage. If the outlet temperature rises over 1.8°F and the 90 sec staging timer has expired the compressor will stage up to 75%. After 90 more sec if the outlet temp is >1.8°F the compressor will stage up to 100%. After another 90 seconds if outlet temp is still outside the 1.8°F (dead-band) the second compressor will start and load up to 50% and so on until the outlet temperature is = to or < 1.8°F above set point. As the loop temp falls, the first compressor on will start to stage down at 90 sec intervals to maintain set point. With the compressor rotation FOFO (first on first off) the next compressor to start will be the second stage.

Partial free cooling (pre-cooling)

Cooling set point = 45°F

Ambient = 46°F Outlet Water Temp (OWT) = 45°F Inlet Water Temp (IWT) = 55°F

At these conditions the chiller is running in 100% mechanical cooling as the ambient temperature falls to a point = to 9°F below the IWT (i.e. 55°F - 9°F = 46°F) the free cooling valve cycles to the free cooling position diverting the 55°F IWT to the free cooling coils. At this point the 46°F ambient temperature is passed across the free cooling coils and pre-cools the IWT dropping the temperature before entering the evaporator thus reducing the load on the compressors which will stage down to maintain set point reducing the energy consumption of the chiller.

Total 100% free cooling

Cooling set point = 45°F

Ambient = 26°F Outlet Water Temp (OWT) = 45°F Inlet Water Temp (IWT) = 55°F

At these conditions the chiller is operating in partial free-cooling as described above with the compressor(s) online and available for added mechanical cooling to meet set point. As the ambient continues to fall to a point = to or > 29°F below the IWT (i.e. 55°F – 29°F = 26°F) the mechanical cooling is locked off as the chillers full tonnage capacity is available by design at this ambient temperature. The condenser/free-cooling fans VFD will modulate on the outlet temperature to maintain set point within 1.8°F. The compressors will stay locked out until the ambient rises to a point where free cooling cannot be maintained. The advantage to this chiller system is that the integration of the free cooling, the mechanical cooling, and the single control system that operates both in one unit. This integration takes all the errors out of trying to control a built-up system and provides the maximum available free cooling at any and all ambient temperatures that make free cooling efficient.

pCo Information

- HMI Screen Navigation
- Input and Outputs
- Alarm Codes/Troubleshooting
- Resetting Compressor/Pump Maintenance Alarm
- pCo Layout
- pCo Smart Key Download



STANDARD 15 BUTTON CONTROL BOARD



OPTIONAL 6 BUTTON REMOTE CONTROL BOARD



MLFC CONTROL BOARD NAVIGATION MANUAL

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STANDARD 15 BUTTON CONTROL PANEL LAYOUT



LEDs Color Description For 15 Button Control Board

ON/OFF Button Green On – Unit on

Flashing – Unit off from supervisor or digital input

ALARM button Red On – One or more alarm conditions have occurred

ENTER button Yellow On – Instrument correctly powered

ON/OFF switches the unit on/off

ALARM displays the alarms, mutes the buzzer and deletes the active alarms

UP ARROW if the cursor is in the home position (top left corner), scrolls up the screens in the same group; if the cursor is in a setting field, increases the value

DOWN ARROW if the cursor is in the home position (top left corner), scrolls down the screens in the same group; if the cursor is in a setting field, decreases the value

ENTER used to move the cursor from the home position (top left corner) to the setting fields, in the setting fields confirms the set value and moves to the next parameter



Takes the user to the main screen which displays the temperature of the fluid entering and leaving the unit as well as the status of the machine.



Maintenance Parameters. Navigating the maintenance loop allows access to software info. Language selection, hour usage for pumps and compressors, as well as the alarm log, and the status of probes and compressors.



Not used on Motivair chillers



Opens first screen of I/O loop. This loop navigates the user through the digital and analogue inputs and outputs



This screen allows the appropriate time and date for the chillers location to be set.



Set Point Parameters. This loop allows the setting of summer and winter setpoints.



Programing Parameters. The programing loop allows the programming and display of the unit's parameters.



To switch between master(circuit#1) and slave(circuit#2)



Not used on Motivair chillers "red button"



Indicates the operation of the cooling mode "blue button"

SCREEN CODE WILL BE SEEN IN THE RIGHT HAND CORNER(see example below) AFTER PRESSING THE ASSOCIATED BUTTON

Maintenance			Programming				Manufacture		
								A N D	
M0	PW - A3	N/A	I0	S0	PW - P0	K1	PW - Z0		
	A4		I1	S1	P1	PW - K2	<u>CONFIGURATION</u>		
	A5		I2	S2	P2	K3	C1		
	A6		I3		P3	K4	Cb		
	A7		I4		P4	K5	Ca		
	A8		I5		P5	K6	Cc		
	AV		I6		Po	K7	C2		
	A9		I7		P6		C3		
	Aa		I8		P7		C4		
	Ab		I9		P8		C5		
	Ac		Ia		P9		C6		
	Ad		Ib		Pa		C7		
	Ae		Ic		Pi		C8		
			Id		Pb		C9		
					Pc		CY		
					Pd		Ch		
					Pv		Cd		
					Pe		Ce		
					Pf		Cf		
					Pg		Cg		
					Ph		Cp		
					Pi		Cq		
					Pj		Cr		
					Pm		Cn		
					Pk		<u>PARAMETERS</u>		
							G1		
							G2		
							G3		
							G4		
							G5		
							G6		
							G7		
							G8		
							G9		
							Ga		
							Gb		
							Gc		
							Gd		
							Ge		
							Gf		
							Gk		
							Gg		

PW = PASSWORD NEEDED

EXAMPLE OF WHERE THE SCREEN CODE
WILL BE FOUND

Summer	S1
setpoint	00.0 F
Winter	
Setpoint	----

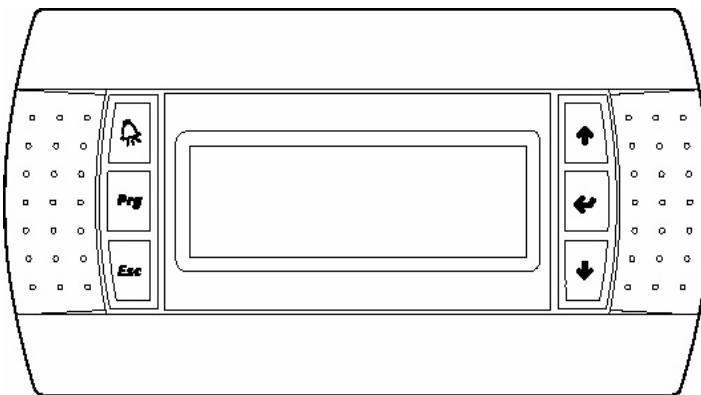
LIST OF ALARM CODES

AL: 001 Unit No. 1 Offline
 AL: 002 Unit No. 2 Offline
 AL: 011 Serious alarm from digital input
 AL: 012 Phase monitor alarm
 AL: 013 Evaporator flow-switch alarm
 AL: 015 Oil level alarm
 AL: 016 High pressure alarm (pressure switch)
 AL: 017 Low pressure alarm (pressure switch)
 AL: 018 Evaporator Pump thermal Cutout
 AL: 020 Compressor thermal cutout
 AL: 021 Condenser 1 Thermal cutout
 AL: 022 Condenser 2 Thermal cutout
 AL: 031 Antifreeze alarm
 AL: 032 Low pressure differential alarm
 AL: 033 High pressure alarm (transducer)
 AL: 034 Low pressure alarm (transducer)
 AL: 035 High delivery temperature alarm
 AL: 041 Alarm: clock card failed or disconnected
 AL: 051 Evaporator pump maintenance
 AL: 053 Compressor Maintenance
 AL: 060 Probe B1 failed or not connected
 AL: 061 Probe B2 failed or not connected
 AL: 062 Probe B3 failed or not connected
 AL: 063 Probe B4 failed or not connected
 AL: 064 Probe B5 failed or not connected
 AL: 065 Probe B6 failed or not connected
 AL: 066 Probe B7 failed or not connected
 AL: 067 Probe B8 failed or not connected
 AL: 101 Driver 1 probe fault
 AL: 102 Diver 1 EEPROM error
 AL: 103 Diver 1 stepped motor error
 AL: 104 Alarm: driver 1 battery
 AL: 105 High pressure (MOP) driver 1
 AL: 106 Low pressure (LOP) driver 1
 AL: 107 Low super-heat alarm, driver 1
 AL: 108 Valve not shut while driver 1 being disabled
 AL: 109 High super-heat alarm, driver 1
 AL: 114 Standby due to EEPROM /battery recharge /open valve error, driver1
 AL: 115 LAN disconnected, driver 1
 AL: 116 Incomplete setup procedure on driver 1

Gh
Gi
Drivers-System EVD Parameters
F0
F2
F3
F4
F5
F6
F7
F8
F9
Fa
Fc
Fd
Drivers-Autosetup
Fs
Ft
Fu
Fv
Fw
Fx
Fy
Drivers-Advanced Settings
Fe
Ff
Fg
Fn
Fo
Fp
Fq
Fr
Timing
T0
T1
T2
T3
T4
T5
T6
T7
Tz
Tf
Tp
Initialization
V0
V1

OPTIONAL 6 BUTTON REMOTE CONTROL BOARD LAYOUT

* BY PRESSING THE Prg BUTTON THIS WILL ACCESS THESE 10 SUB MENUS*



- 1) Maintenance
- 2) Input/Output
- 3) Clock
- 4) Set Point
- 5) User
- 6) Manufacture
- 7) Summer/Winter
- 8) On/Off
- 9) History
- 10) Unit Change

See pages 3 & 4 for parameters

ALARM		UP
PRG		ENTER
ESC		DOWN

ALARM Displays the alarms, mutes the buzzer and deletes the active alarms

UP If the cursor is in the home position (top left corner), scrolls up the screens in the same group; if the cursor is in a setting field, increases the value

DOWN If the cursor is in the home position (top left corner), scrolls down the screens in the same group; if the cursor is in a setting field, decreases the value

ENTER Used to move the cursor from the home position (top left corner) to the setting fields, in the setting fields confirms the set value and moves to the next parameter

PRG Accesses the menu for selecting the group of parameters to be displayed/modified (access to the parameters is confirmed by pressing the [Enter] button)

PRG + ENTER In pLAN applications with more than one board connected in the network and a shared user terminal, switches the user terminal between the different units to display/modify the parameters

ESC + ENTER Pressed at the same time for 20 seconds access the screen for switching the unit On/Off

LEDs Color Description For 6 Button Control Board

Alarm Button (Red On) One or more alarm conditions have occurred

Enter Button (Yellow On) Unit on

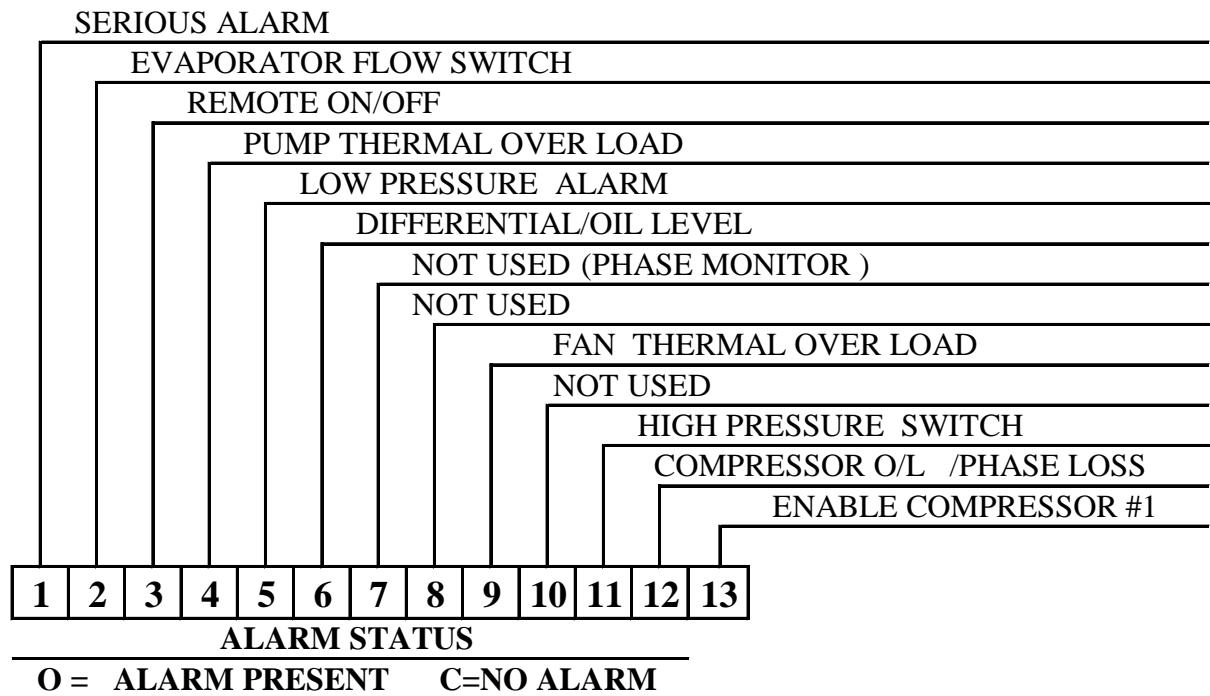
Enter Button (Flashing) Unit off from supervisor or digital input

PRG Button (Green On) Displaying/modifying the operating parameters

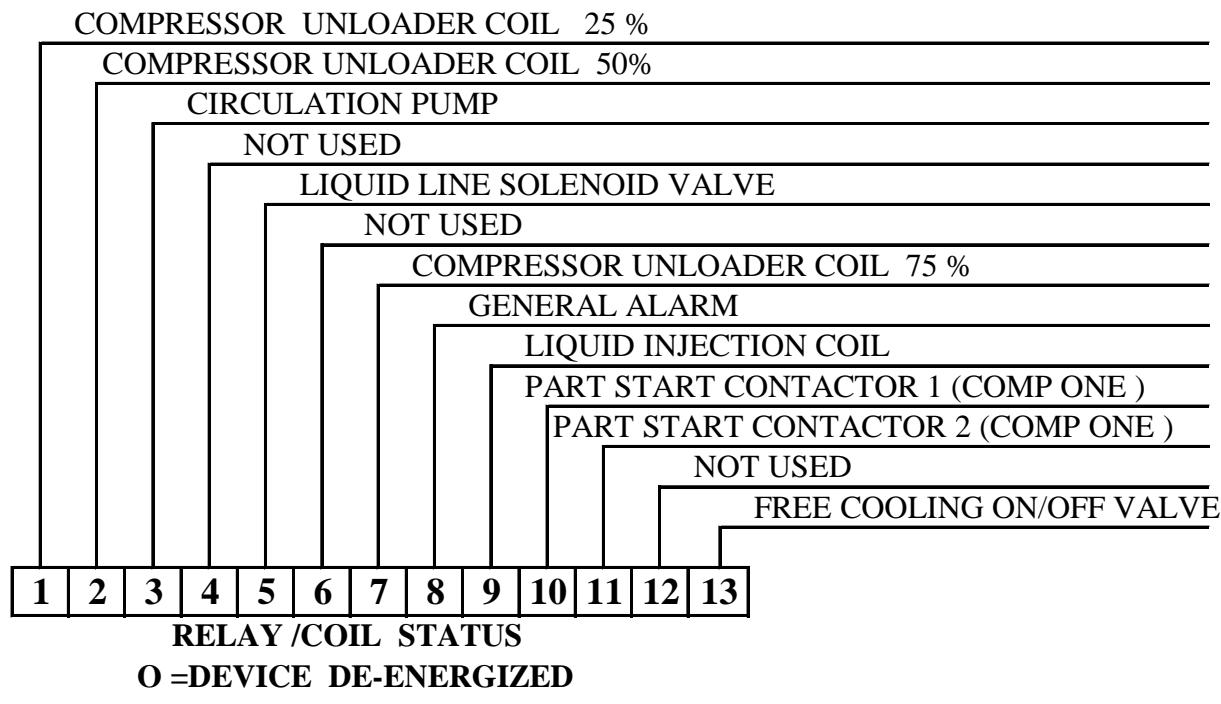
ESC Button (Green On) Main menu parameters displayed

Master I/O Chart

Digital Inputs

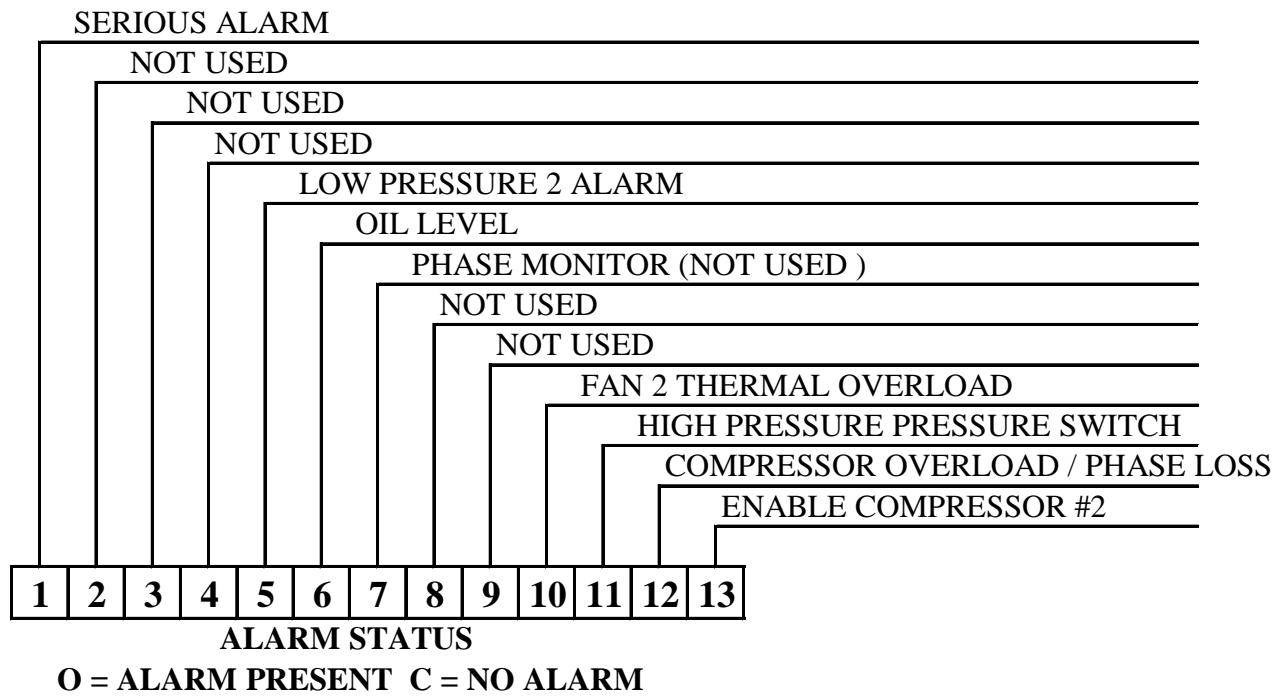


Digital Outputs

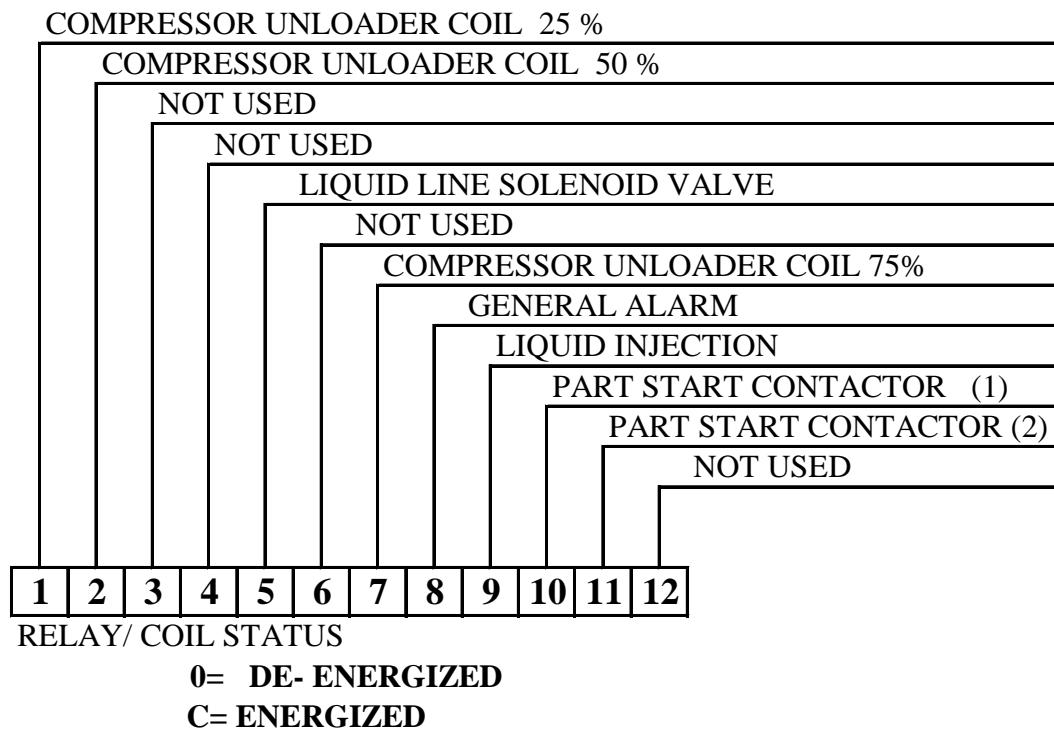


SLAVE I/O Chart

Digital Inputs



Digital Outputs



7.3 CHILLER UNIT WITH FREECOOLING – MACHINE TYPE “2”

DIGITAL INPUTS

pCO2 / pCO3 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
ID 1	Serious Alarm	Serious Alarm
ID 2	Evaporator Flow-switch	Evaporator Flow-switch
ID 3	Remote ON/OFF	Remote ON/OFF
ID 4	Pump Thermal cutout	
ID 5	Low Pressure 2 Pressure-switch	Low Pressure 2 Pressure-switch
ID 6	Differential / Oil Level	Differential / Oil Level
ID 7	Phase monitor	Phase monitor
ID 8	Double Set-point	
ID 9	Fan 1 Thermal cutout	Fan 1 Thermal cutout
ID10	Fan 2 Thermal cutout	Fan 2 Thermal cutout
ID11	High Pressure Pressure-switch	High Pressure Pressure-switch
ID12	Compressor Thermal cutout	Compressor Thermal cutout
ID13		
ID14		

pCO1 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
	Serious Alarm	Serious Alarm
	Evaporator Flow-switch	Evaporator Flow-switch
	Remote ON/OFF	Remote ON/OFF
	Pump Thermal cutout	
	Low Pressure 2 Pressure-switch	Low Pressure 2 Pressure-switch
	Differential / Oil Level	Differential / Oil Level
	Phase monitor	Phase monitor
	Double Set-point	
	Fan 1 Thermal cutout	Fan 1 Thermal cutout
	Fan 2 Thermal cutout	Fan 2 Thermal cutout
	High Pressure Pressure-switch	High Pressure Pressure-switch
	Compressor Thermal cutout	Compressor Thermal cutout

ANALOGUE INPUTS

pCO2 / pCO3 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
B1	Water temperature at Evaporator Inlet ⁽¹⁾	
B2	Water temperature at Evaporator Outlet ⁽¹⁾	Water temperature at Evaporator Outlet ⁽¹⁾
B3	Water temperature at Freecooling Inlet ⁽¹⁾	
B4	Outlet Temperature ⁽⁴⁾	Outlet Temperature ⁽⁴⁾
B5	Outside Air Temperature ⁽¹⁾	
B6	Voltage / Current / External Set-point ⁽⁵⁾	Voltage / Current ⁽⁵⁾
B7	High Pressure ⁽²⁾	High Pressure ⁽²⁾
B8	Low Pressure ⁽²⁾	Low Pressure ⁽²⁾

pCO1 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
	High Pressure ⁽³⁾	High Pressure ⁽³⁾
	Low Pressure ⁽³⁾	Low Pressure ⁽³⁾
	Voltage / Current / External Set-point ⁽⁶⁾	Voltage / Current ⁽⁶⁾
	Outlet Temperature ⁽⁷⁾	Outlet Temperature ⁽⁷⁾
	Water temperature at Evaporator Inlet ⁽¹⁾	
	Water temperature at Evaporator Outlet ⁽¹⁾	Water temperature at Evaporator Outlet ⁽¹⁾
	Outside Air Temperature ⁽¹⁾	
	Water temperature at Freecooling Inlet ⁽¹⁾	

(1) NTC

(2) 4-20 mA

(3) 4-20mA/0-5V

(4) NTC-HT/4-20mA/NTC/PT1000

(5) 4-20mA/0-1V/0-10V

(6) 4-20mA/0-1V

(7) NTC-HT/4-20mA/NTC

DIGITAL OUTPUTS

pCO2 / pCO3 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
	Generic	Bitzer
N01	Relay 1	CR1
N02	Relay 2	CR2
N03	Circulation Pump	
N04	Fan 1	Fan 1
N05	Liquid Solenoid	Liquid Solenoid
N06	Antifreeze Heater	Antifreeze Heater
N07	Relay 3	CR3
N08	General Alarm	
N09	Liquid inj./Econ/Oil cooler	Liquid inj./Econ/Oil cooler
N010	Line Contactor	PW1
N011	Triangle Contactor	PW2
N012	Star Contactor	CR4
N013	Freecooling ON/OFF Valve	

pCO1 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
	Generic	Bitzer
	Relay 1	CR1
	Relay 2	CR2
	Circulation Pump	
	Fan 1	Fan 1
	Liquid Solenoid	Liquid Solenoid
	Antifreeze Heater	Antifreeze Heater
	Relay 3	CR3
	General Alarm	
	Liquid inj./Econ/Oil cooler	Liquid inj./Econ/Oil cooler
	Line Contactor	PW1
	Triangle Contactor	PW2
	Star Contactor	CR4
	Freecooling ON/OFF Valve	

ANALOGUE OUTPUTS

pCO2 / pCO3 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
Y1	Speed Controller	Speed Controller
Y2	3-way Freecooling Valve	
Y3		
Y4		

pCO1 MEDIUM		
	Master (Address 1)	Slave (addresses 2/3/4)
	Speed Controller	Speed Controller
	3-way Freecooling Valve	

MLCFC ALARM CODES

AL: 001 Unit No. 1 Offline
AL: 002 Unit No. 2 Offline
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AL: 101 Driver 1 probe fault
AL: 102 Diver 1 EEPROM error
AL: 103 Diver 1 stepped motor error
AL: 104 Alarm: driver 1 battery
AL: 105 High pressure (MOP) driver 1
AL: 106 Low pressure (LOP) driver 1
AL: 107 Low super-heat alarm, driver 1
AL: 108 Valve not shut while driver 1 being disabled
AL: 109 High super-heat alarm, driver 1
AL: 114 Standby due to EEPROM /battery recharge / or open valve error, driver 1
AL: 115 LAN disconnected, driver 1
AL: 116 Incomplete setup procedure on driver 1

Alarms are divided into three categories

- 1) Serious alarms (deactivates the entire system, signal on the display, buzzer, alarm relay)
- 2) Circuit alarms (deactivates only the corresponding circuit, signal on the display, buzzer, alarm relay)
- 3) Signal-only alarms (signal on the display, buzzer, alarm relay)

Serious alarms (page# 1)

- Phase monitor alarm (RVG)
- Evaporator flow alarm
- Pump thermal cutout

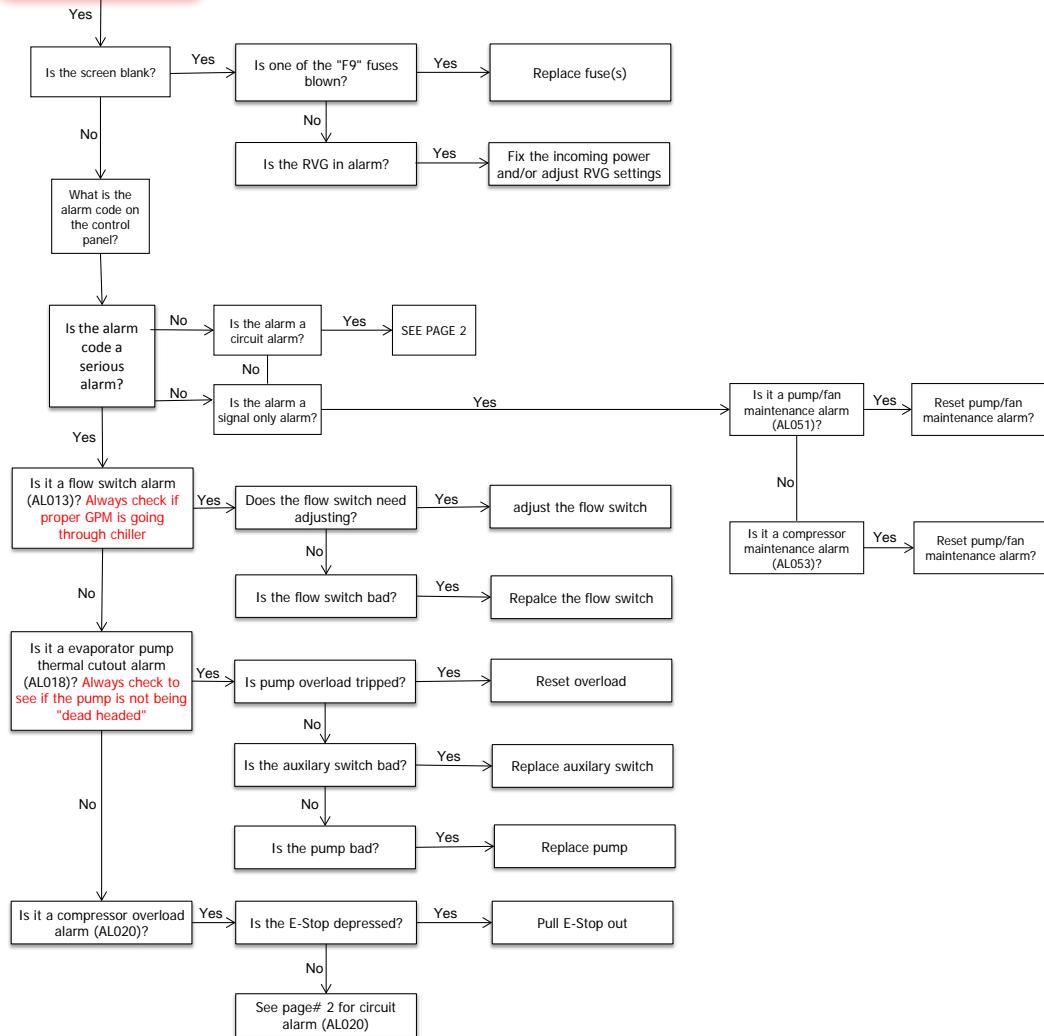
Signal only alarms (page# 1)

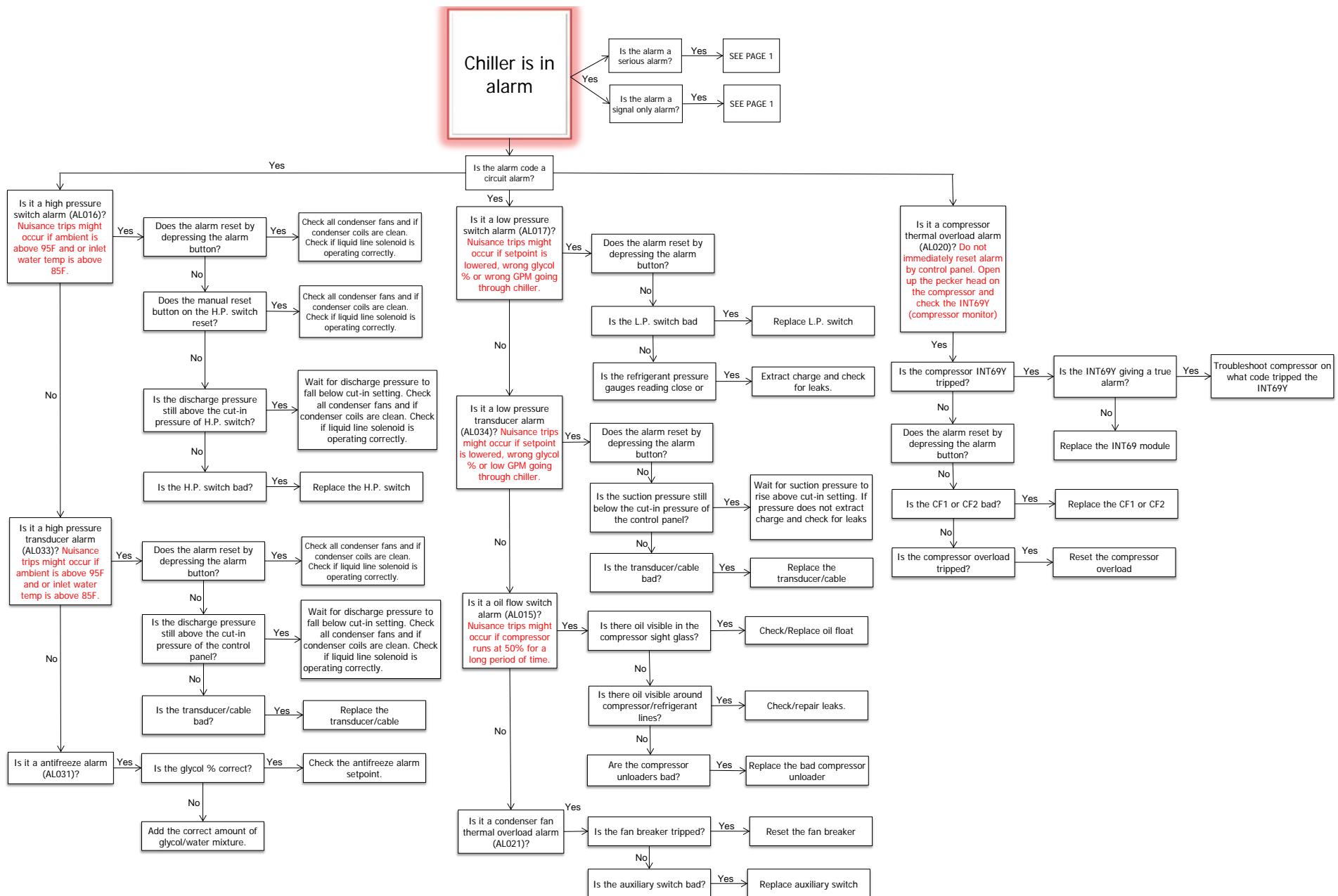
- Pump maintenance alarm
- Compressor maintenance alarm

Circuit alarms (page# 2)

- High pressure switch/transducer alarm
- Antifreeze alarm
- Low pressure switch/transducer alarm
- Oil flow switch alarm
- Fan thermal overload alarm
- Compressor thermal overload alarm

Chiller is in alarm





Reset of Maintenance Pump/Compressor alarm

Alarms will not shutdown the chiller. It will only give a display alarm to let the user know that it is time to perform a routine maintenance of the pump(s) or compressor(s).

To reset the alarm for MLCFC chillers:



Hit the wrench key see above picture and scroll in the maintenance screen until you see enter maintenance password. Hit enter then enter 1234 then hit enter.

Then use the up or down arrow to get “A4” for pump hours reset or “A6” for compressor reset hours. When in “A4” or “A6” screen hit enter till on the “N” use your up arrow to get to “Y” hit enter again and this will reset the alarm. Hit menu twice to exit to the main screen.

Note that on MLCFC chillers you must reset the compressor hours on both the master and slave.



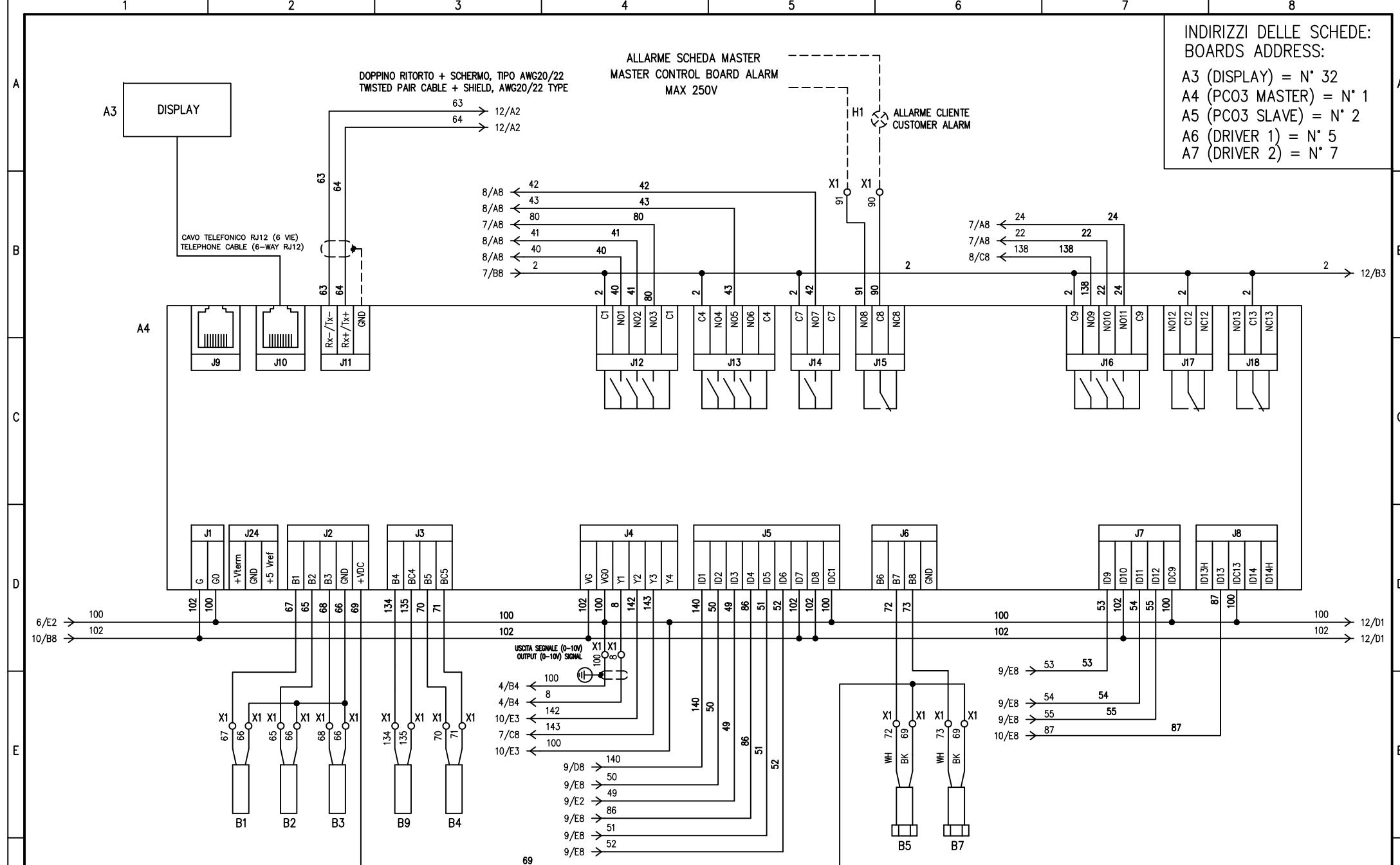
Depending on what circuit had the maintenance alarm to switch circuits just hit the “?” key and this will switch back and forth from circuit#1 “U1” or circuit# 2 “U2”. Just follow the same steps to reset the alarm on circuit #2.

To reset the alarm for MPCFC chillers:

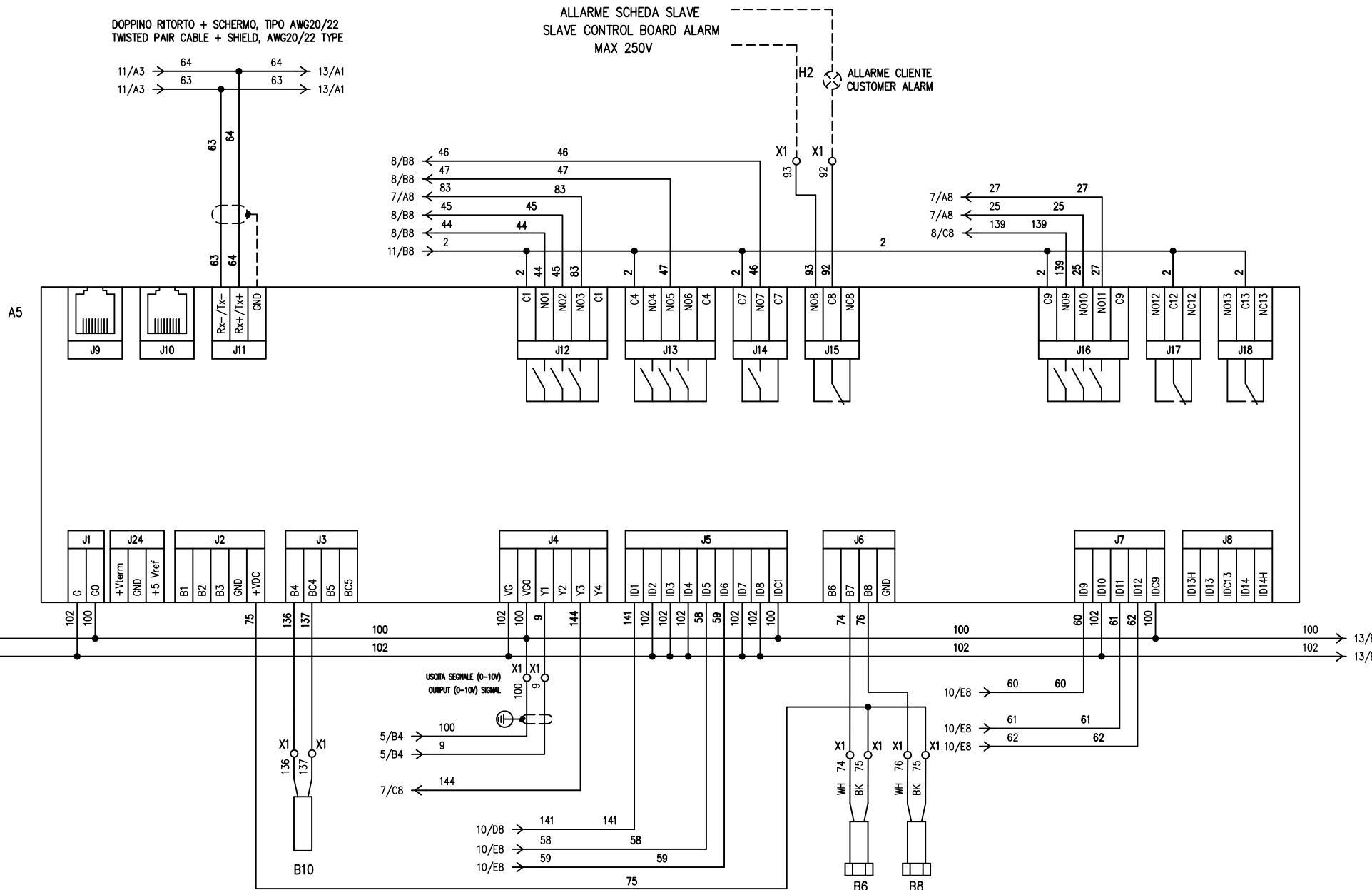


Hit the wrench key see above picture and scroll in the maintenance screen until you see enter maintenance password. Hit enter then enter 1234 then hit enter.

Then use the up or down arrow to get “Aa” for pump hours reset or “Ab” for compressor reset hours. When in “Aa” or “Ab” screen hit enter till on the “N” use your up arrow to get to “Y” hit enter again and this will reset the alarm. Hit menu twice to exit to the main screen.



CIRCUITO AUXILIARIO – AUXILIARY CIRCUIT			MODELLO MODEL MLC-FC-E850/CS.ST.NT.NP.ULC.SEC.EB.ES.IFO...	TITOLO-TITLE MLC-FC-E850/CS.ST.NT.NP.ULC.SEC.EB.ES.IFO.ETS.PDF.PVT.CSF.RVG.PCN.R134a.MT		N. DIS.-DRAW N. EF750W12M	PAGINA-PAGE 11							
REV.	DATA-DATE	OGGETTO MODIFICA-OBJECT MODIFICATION	FIRMA SIGNATURE I. Zecchin	MOTIVAIR	COMMESMA	SPECIFICA 130/11	REV. 0	DATA-DATE 24/05/11	PAG. TOT. 16					
0	24/05/11	Emissione			ORIGINE									
Proprieta' riservata-Riproduzione vietata a termine di legge-Copyrgt-Nachdruck verboten-Propriete reservee							1	2	3	4	5	6	7	8



CIRCUITO AUSILIARIO – AUXILIARY CIRCUIT				MODELLO MODEL MLC-FC-E850/CS.ST.NT.NP.ULC.SEC.EB.ES.IFO...	TITOLO-TITLE MLC-FC-E850/CS.ST.NT.NP.ULC.SEC.EB.ES.IFO.ETS.PDF.PVT.CSF.RVG.PCN.R134a.MT	N. DIS.-DRAW N. EF750W12M	PAGINA-PAGE 12
REV.	DATA-DATE	OGGETTO MODIFICA-OBJECT MODIFICATION	FIRMA SIGNATURE	MOTIVAIR	COMMESSA SPECIFICA 130/11	REV.	DATA-DATE PAG. TOT. 24/05/11 16
0	24/05/11	Emissione	I. Zecchin		ORIGINE	0	
				Proprieta' riservata-Riproduzione vietata a termine di legge-Copyrigt-Nachdruck verboten-Propriete reservee			
1	2	3	4	5	6	7	8

USING THE CAREL SMART KEY

UPLOAD BOTH SAME TIME

1. POWER OFF THE CHILLER
2. DISCONNECT AND REMOVE ANY BMS SERIAL CARDS
3. DISCONNECT THE CABLE THAT CONNECTS THE MASTER PCO TO THE SLAVE PCO AT BOTH THE MASTER AND THE SLAVE (CONNECTION J11 NEXT TO THE BLACK TELEPHONE TYPE CABLE)
4. ON THE MASTER CONTROLLER REMOVE THE TELEPHONE TYPE CONNECTOR AND PLUG IN THE CABLE FROM THE SMART KEY INTO THE PORT J10 (THE KEYS ARE MARKED MASTER OR SLAVE) PLUG THE SLAVE KEY INTO J10 ON THE SLAVE PCO
5. POWER UP THE CHILLER
6. THE SMART KEY SHOULD BEEP AND TWO ARROWS SHOULD BE FLASHING
7. WHEN THE ARROWS CHANGE TO ONE SOLID, POINTING TOWARDS THE PLC PRESS THE START BUTTON ON BOTH SMART KEYS , THIS WILL START THE UPLOAD PROCESS THE FASTER THE ARROW FLASHES THE FARTHER WE ARE IN TO THE UPLOAD , WHEN THE PROCESS IS COMPLETE THE SMART KEY WILL BEEP CONFIRMING THAT THE UPLOAD IS SUCESSFUL
8. POWER DOWN THE CHILLER AND REMOVE KEYS
9. RECONNECT ALL WIRES AND CAREFULLY REINSTALL ANY BMS CARDS REMOVED.
10. POWER UP THE CHILLER AND CHECK THE VERSION # TO VERIFY PROGRAM.

Compressor Information

- Compressor Pump Down
- Oil Differential Switch
- Oil Float Switch
- Oil Filter Replacement
- Compressor Protection Module (INT69Y)
- Compressor P & ID

System Pump down

Hanbell screw compressors may be pumped down once to move and isolate the refrigerant in the receiver and condenser portion of the system.

WARNING: Hanbell compressors use the discharge refrigerant pressure to provide positive oil pressure to the screws and bearings for lubrication DO NOT PUMP DOWN more than one time. Do not pump down longer than 3 minutes. The complete isolation of refrigerant is not possible, additional transfer is required with the use of approved recovery equipment.

The pump down procedure should be accomplished with the chiller running at least 3-5 minutes to ensure the EXV and LLS is open to provide refrigerant removal between the receiver outlet and the EXV.

The pump down will trap the refrigerant between the receiver service valve and the compressor discharge check valve. The oil separator and crankcase of the compressor will still contain a small amount of high pressure refrigerant that will need to be removed by recovery equipment.

Pump down procedure:

1. Start and operate the compressor for 3-5 minutes until the EXV and staging reaches 50% or more.
2. Close the service valve (front seat) on receiver outlet.
3. The circuit will pump down until the low pressure switch opens stopping the compressor trapping 90% of the charge between the service valve and the compressor discharge check valve.
4. Turn off the disconnect switch.
5. Close the compressor discharge service valve (front seat).
6. Connect recovery equipment to the compressor suction service valve and remove the remaining refrigerant from the compressor, evaporator, and liquid line driers.
7. After all the refrigerant pressure is removed the compressor and the liquid line driers can be serviced.

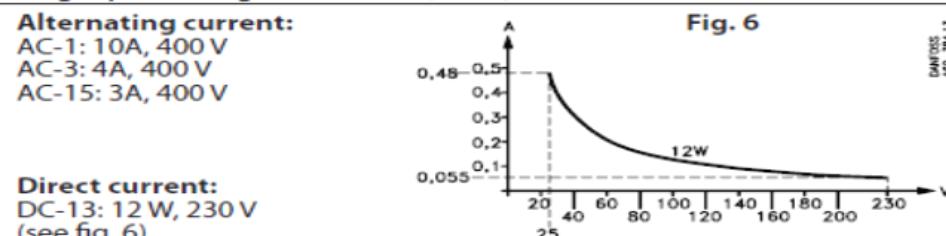
WARNING: Hanbell compressors use polyester oil do not expose to the atmosphere or high humidity for extended periods. All polyester oil is extremely hydroscopic. Follow recognized and approved safe handling and system evacuation procedures. Any contaminated oil must be replaced.

COMPRESSOR OIL DIFFERENTIAL SWITCH

ALL MOTIVAIR SCREW COMPRESSORS ARE SET TO TRIP OUT AT 25psig
 IT IS RECOMMENDED THAT THE OIL FILTER BE CHANGED WHEN THE COMPRESSOR
 SEES A 15psig DIFFERENTIAL



Designation	RT pressure switches
Ambient temperature	In general -50 to 70°C; Diaphragm version -10 to 70°C VD TÜV approved -40 to 70°C
Media temperature	In general -40 to 100°C; Diaphragm version -10 to 90°; VD TÜV appr. -40 to 150°C, see page 6 (Steam plant)
Contact system	<p>Single-pole changeover switch (SPDT)</p>
Contact load	<p>Alternating current: AC-1: 10A, 400V AC-3: 4A, 400V AC-15: 3A, 400V</p> <p>Direct current: DC-13: 12 W, 230 V (see fig. 6)</p>
Contact material:	AgCdO
Special contact system	See "accessories" page 13
Cable entry	2 PG 13.5 for 6 - 14 mm diameter cables
Enclosure	IP 66 acc. to IEC 529 and EN 60529. Units supplied with external reset. IP 54. The thermostat housing is made of bakelite acc. to DIN 53470 Cover is made of polyamide.



Oil filter testing and replacement

The oil filter pressure differential testing and recording is required during normal maintenance.

Good compressor lubrication is essential and requires a clean oil filter – testing the pressure drop across the oil filter ensures an adequate supply of oil to all compressor components.

The oil pressure is provided by the refrigerant discharge pressure and forced through a micron filter to the bearings, screws, and slide valve. The pressure drop (difference) across the oil filter must not exceed 25 psi and should be changed at a difference greater than 15 psi.

Pressure drop testing procedures.

Install a high pressure gauge and record readings from both the High and Low side pressure taps with compressor operating above 25% capacity. Record the difference.

Hanbell RC Compressor oil ports

	
Oil Float switch side and HIGH pressure tap for oil filter differential pressure reading	Oil Filter cartridge side and LOW pressure tap for oil filter differential pressure reading.

Normal differential = 5 - 15 psid - Max differential = >15 psid (change filter) - Alarm point is 25 psid

COMPRESSOR MODULE (INT69HBY)

Application

The motor protector INT69HBY has been specially developed to monitor motor winding temperature, phase sequence and phase failure on compressors. Compared to INT69Y, it has more functions, such as locked rotor lockout reset and twin LED information.

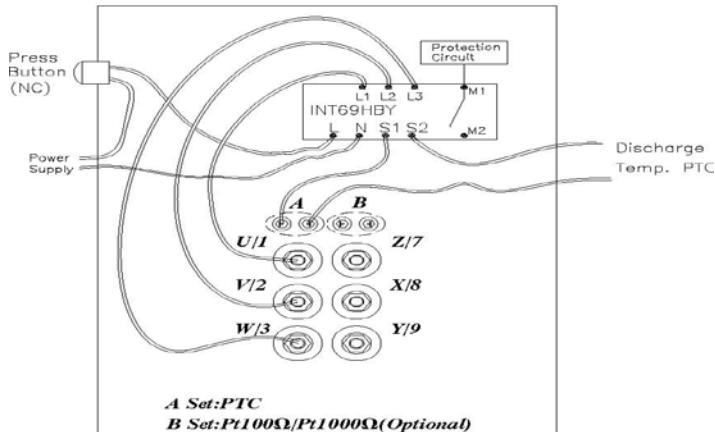
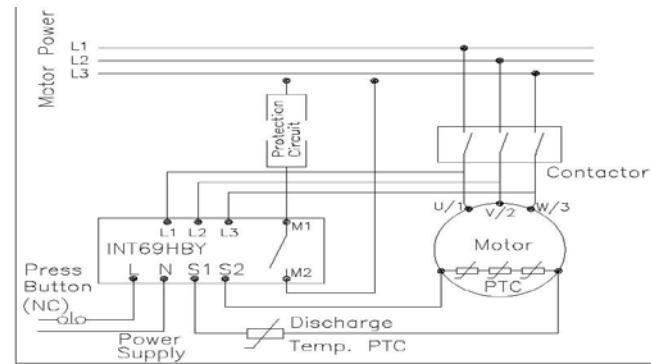
Description

- When supply voltage is applied, the output relay pulls in after an initialization period of approx. 3 seconds, provided all thermistors lie below their rated response temperature.
- 1 to 9 PTC thermistors with varied rated response temperatures can be connected in series to the input terminals.
- If any thermistor resistance increases above trip level the relay drops out. This failure results in a lockout. (5 minutes delay for 1st PTC failure, 60 minutes delay for 2nd failure, lockout for 3rd failure.)
- If a rapid temperature increase is detected (locked rotor condition), the output relay drops out. This failure results in a lockout.
- The phase monitoring function is active 1 second after motor start during a 10 second window. Incorrect phase sequence results in lockout trip. Phase loss results in lockout trip.
- Lockout and time delay can be cancelled by mains reset of approx. 5 seconds.
- To avoid nuisance tripping due to reverse running after shutdown (pressure equalization), the phase monitoring function is only re-enabled approx. 20 seconds after motor stop.
- A twin LED (red / green) provides operational information.
- The relay is fed out as an N/O dry contact, which is closed under good conditions.
- Sensor and supply circuits are galvanic isolated.
- The motor protector is not suitable for use with frequency converters.

COMPRESSOR MODULE (INT69HBY)

Technical Data

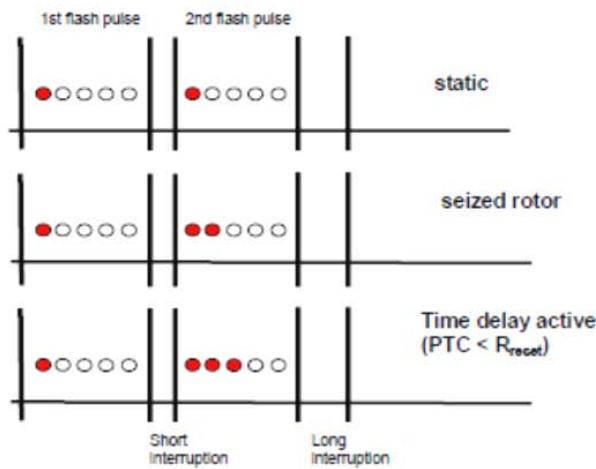
Supply voltage -dual voltage	AC 50/60Hz 115/120V -15...+10% 3VA AC 50/60Hz 230/240V -15...+10% 3VA
Ambient temperature range	-30...+70°C
Temperature monitoring -Number of sensors -R 25, total -R trip static -R reset -max. lead length	PTC, to DIN 44081/082 1...9 in Series < 1.8kΩ 4.5kΩ ± 20% 2.75kΩ ± 20% < 30m
Time delay after cool down -static trip dynamic trip(locked rotor)	- lockout lockout
Phase monitor	3 AC 50/60Hz 200...575V ±10% active window : $t_0 + 1s \dots t_0 + 11s$
Phase sequence Phase loss	lockout lockout
Relay -AgNi 90/10	max. AC 240V, max. 2.5A, C300 min. >24V AC/DC, >20mA
Mechanical service life	approx. 1 mio. switching cycles
Protection class acc. to EN 60529	IP00
Connection	6.3mm connectors (Faston)
Housing material	PA66 GF25
Mounting	Screw mounted or latching
Dimensions	76.5x81.5x34.5mm
Weight	approx. 200g



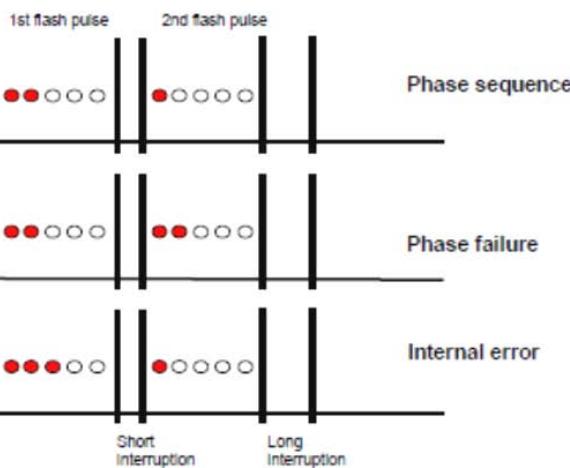
COMPRESSOR MODULE (INT69HBY)

Blink code INT69 HBY

PTC

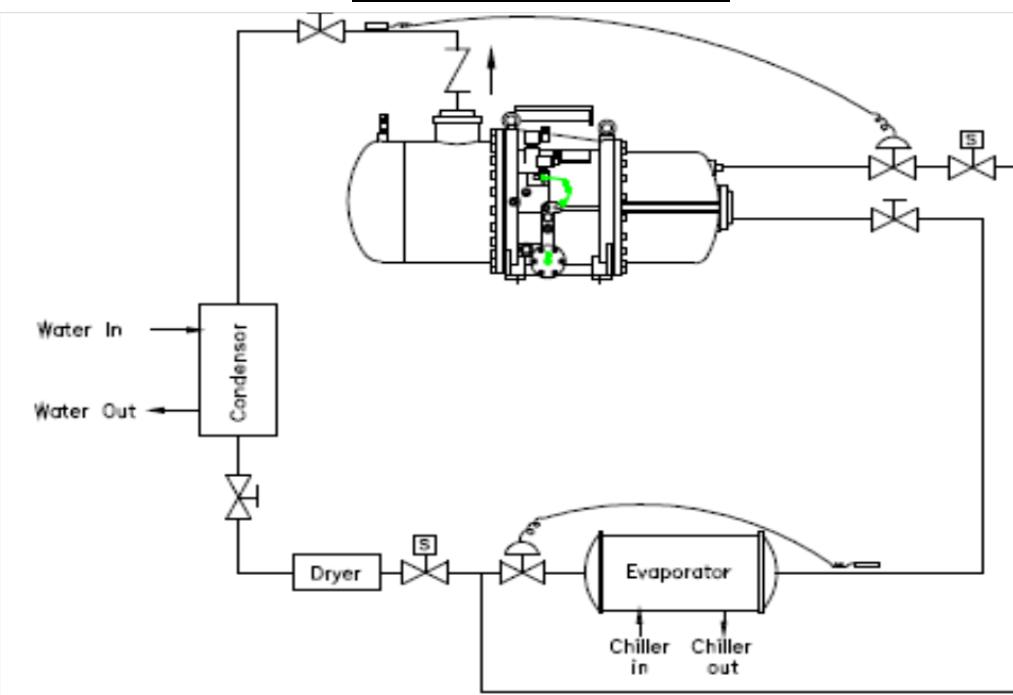


Phase monitoring / General

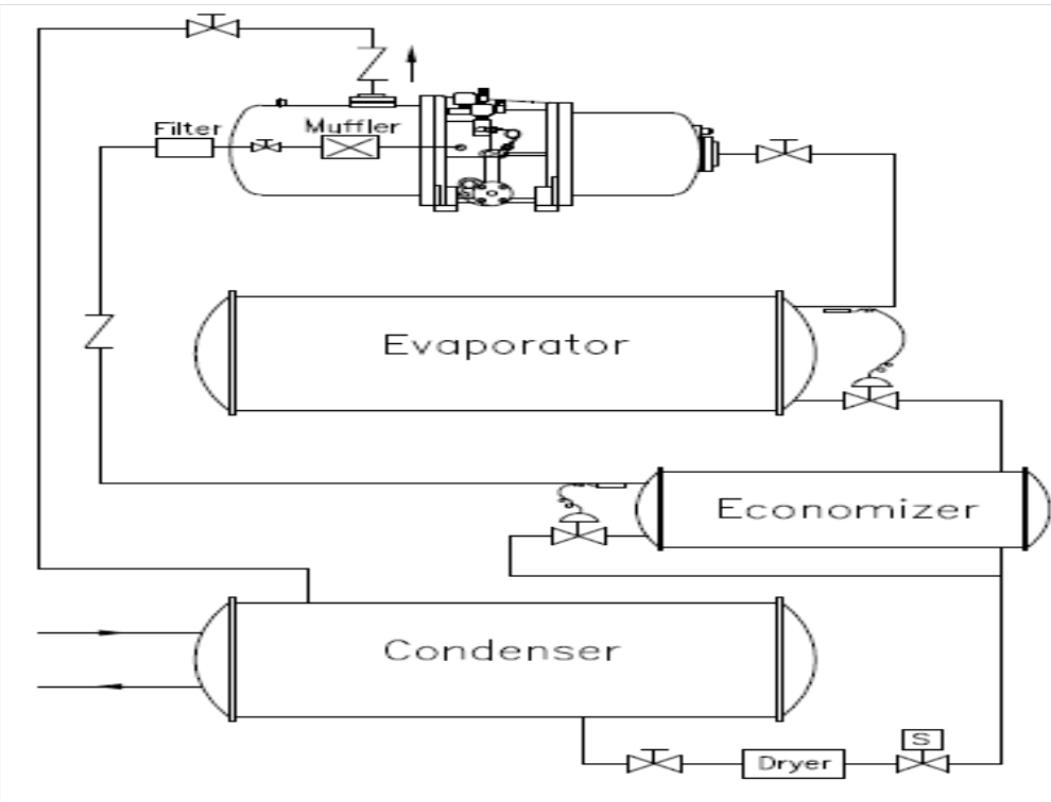


MLC LIQUID INJECTION AND ECONIMIZER PI & D

LIQUID INJECTION PI & D



ECONOMIZER PI & D



Condenser Fan VFD

Information

- Powerflex 40 and 400 general layout
- Powerflex 40 and 400 parameters

POWERFLEX 40 and 400 QUICK VIEW

POWERFLEX 40

Integral Keypad



Output Freq
S^m 60.00 Hz

PROGRAM FAULT

Operator Keys

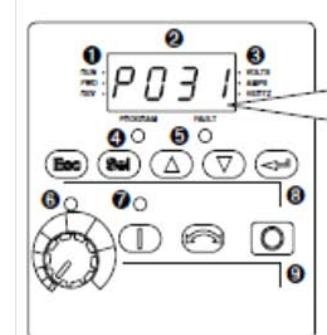
Key	Name	Description
	Escape	Back one step in programming menu. Cancel a change to a parameter value and exit Program Mode.
	Select	Advance one step in programming menu. Select a digit when viewing parameter value.
	Up Arrow	Scroll through groups and parameters. Increase/decrease the value of a flashing digit.
	Down Arrow	
	Enter	Advance one step in programming menu. Save a change to a parameter value.
	Digital Speed Increment and Decrement Arrows	Used to control speed of drive. Default is active. Control is activated by parameter P038 [Speed Reference] or P042 [Auto Mode].
	Run/Start & Hand ⁽¹⁾	Used to start the drive. Default is Hand mode as controlled by parameter P042 [Auto Mode]. Control is activated by parameter P036 [Start Source] or P042 [Auto Mode].
	Auto ⁽¹⁾	Used to select Auto control mode. Controlled by parameter P042 [Auto Mode].
	Stop/Off	Used to stop the drive or clear a fault. This key is always active. Controlled by parameter P037 [Stop Mode].

LED Status Indicators

LED	LED State	Description
	Steady Red	Indicates parameter value can be changed. Selected digit will flash.
	Flashing Red	Indicates that the drive is faulted.
	Steady Green	Indicates that the digital speed control keys are enabled.
	Steady Green	Indicates that the Run/Start key is enabled.
	Steady Yellow	Indicates that the drive is in Auto mode.

POWERFLEX 400

Integral Keypad



Menu **Description**

D	Display Group (View Only) Consists of commonly viewed drive operating conditions.
P	Basic Program Group Consists of most commonly used programmable functions.
R	Advanced Program Group Consists of remaining programmable functions.
F	Fault Designator Consists of list of codes for specific fault conditions. Displayed only when fault is present.

No. **LED** **LED State** **Description**

1	Run/Direction Status	Steady Red Flashing Red	Indicates drive is running and commanded motor direction. Drive has been commanded to change direction. Indicates actual motor direction while decelerating to zero.
2	Alphanumeric Display	Steady Red Flashing Red	Indicates parameter number, parameter value, or fault code. Single digit flashing indicates that digit can be edited. All digits flashing indicates a fault condition.
3	Displayed Units	Steady Red	Indicates the units of the parameter value being displayed.
4	Program Status	Steady Red	Indicates parameter value can be changed.
5	Fault Status	Flashing Red	Indicates drive is faulted.
6	Pot Status	Steady Green	Indicates potentiometer on Integral Keypad is active.
7	Start Key Status	Steady Green	Indicates Start key on Integral Keypad is active. The Reverse key is also active unless disabled by A095 [Reverse Disable].

No. **Key** **Name** **Description**

6		Escape	Back one step in programming menu. Cancel a change to a parameter value and exit Program Mode.
		Select	Advance one step in programming menu. Select a digit when viewing parameter value.
		Up Arrow	Scroll through groups and parameters. Increase/decrease the value of a flashing digit.
		Down Arrow	
		Enter	Advance one step in programming menu. Save a change to a parameter value.
9		Potentiometer	Used to control speed of drive. Default is active. Controlled by parameter P038 [Speed Reference].
		Start	Used to start the drive. Default is active. Controlled by parameter P036 [Start Source].
		Reverse	Used to reverse direction of the drive. Default is active. Controlled by parameters P036 [Start Source] and A095 [Reverse Disable].
		Stop	Used to stop the drive or clear a fault. This key is always active. Controlled by parameter P037 [Stop Mode].

POWERFLEX 400 PARAMETERS

- P033 = Match setting to equal total full load amps of fans
- P036 = 2 start source
- P038 = 2 speed reference
- P039 = 1.00 accel time
- P040 = 1.00 decel time
- P042 = 0 auto mode
- A 163 = 5 auto restart tries
- A 164 = 5 auto restart delay
- A165 = 1 start up at power up
- A167 = 1 flying start enabled
- A175 = 0 slip hertz
- T069 = 0 - 10 V analog in select
- T070 = 30% analog in low

POWERFLEX 40 PARAMETERS

- A92 = 5 (Auto restart tries)
- A93 = 5 (Delay restarts)
- A94 = 1 (Start up at power up)
- A96 = 1 (Flying start enabled)
- A110 = 30 (Analog low)
- A114 = 0 (Slip hertz)
- P033 = 3 (Internal overload set to match FLA of condenser fans plus service factor)
- P036 = 3 (Start source)
- P038 = 2 (Speed reference)
- P039 = 1 (Accel Time)
- P040 = 1 (Decel Time)

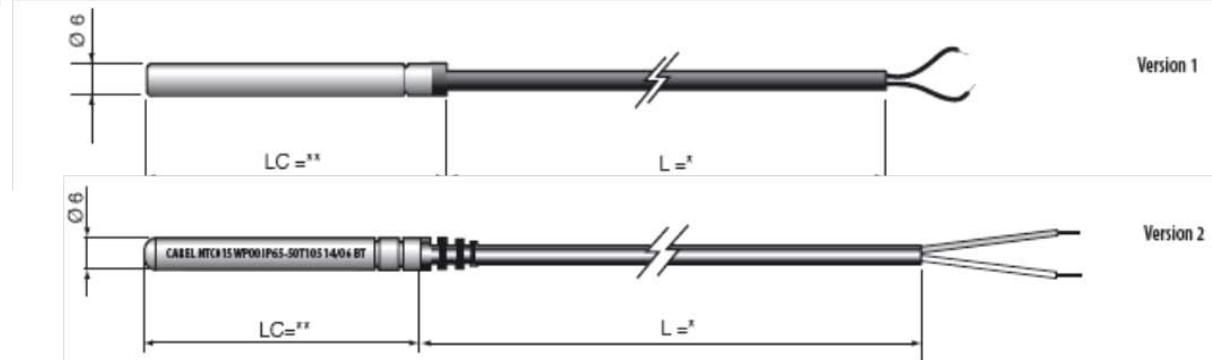
Temperature Probe Information

- Probe Specifications
- Probe Ohm Chart
- Calibration of Probes

PROBE SPECIFICATIONS

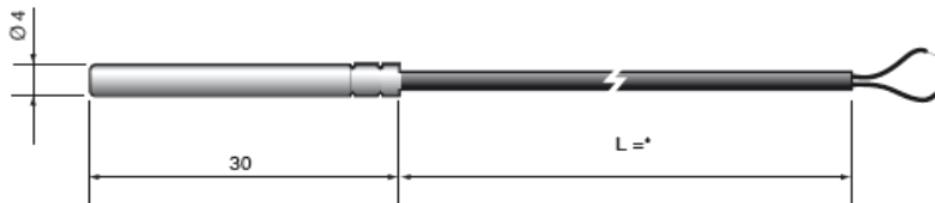
INLET - OUTLET - FREECOOLING PROBE

Storage conditions	-20T70 °C
Operating range	-50T105 °C
Connections	Stripped ends, dimensions: 5±1 mm
Sensor	NTC 10 kΩ ±1% at 25 °C Beta 3435
Dissipation factor (in air)	approx. 2.2 mW/°C
Thermal constant over time (in water)	approx. 10 s
Cable	Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max
Sensitive element index of protection	IP68 Immersion in water 1 m depth for 200 h at 70 °C Resistance in autoclave to saturated steam 30 min. at 105 °C
Sensitive element housing	PP/Co with AISI 316 outer cap
Classification according to protection against electric shock (sensitive element & cable)	Supplementary insulation for 250 Vac;
Category of resistance to heat and fire	Flame retardant
Standard	* * = 52/100/200/300(mm dimension) NSF



SUPERHEAT PROBE

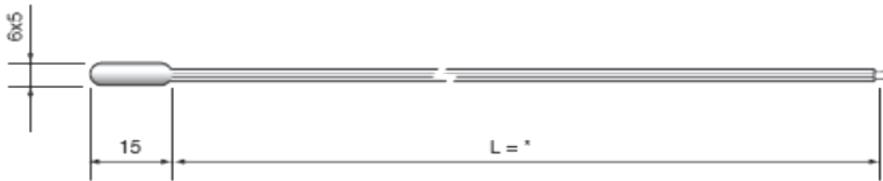
Storage conditions	-20T70 °C
Operating range	-50T105 °C
Connections	Stripped ends, dimensions: 5±1 mm
Sensor	NTC 10 kΩ ±1% at 25 °C Beta 3435
Dissipation factor (in air)	approx. 7 mW/°C
Thermal constant over time (in water)	approx. 4.5 s
Cable	Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max.
Sensitive element index of protection	IP67
Sensitive element housing	AISI 316 steel diameter 4 mm - L= 30 mm
Classification according to protection against electric shock (sensitive element & cable)	Basic insulation for 250 Vac;
Category of resistance to heat and fire	Flame retardant



PROBE SPECIFICATIONS

COMPRESSOR DISCHARGE PROBE

Storage conditions	-20 to 70 °C
Operating range	-50 to 105 °C in air -50 to 50 °C in fluid
Connections	Stripped ends, dimensions: 5±1 mm
Sensor	Pt1000 - Class B
Dissipation factor (in air)	approx. 3 mW/°C
Thermal constant over time (in air)	ca. / approx. 75 s
Cable	Black two-wire flat cable, with tinned copper wire size 0.3 mm ²
Sensitive element index of protection	IP67
Sensitive element housing	Polyolefin
Classification according to protection against electric shock (sensitive element & cable)	Basic Insulation for 250 Vac
Category of resistance to heat and fire	Flame retardant



AMBIENT AIR PROBE



General purpose, over-molded, IP67, thermoplastic cap 'dimension Ø6x15mm'

Cable: Thermoplastic - 1,5/3,0m

Temp. range: -40 ÷ 110°C (-40 ÷ 230°F)

INLET, OUTLET, FREECOOLING, SUPERHEAT PROBES

Temp.	Resistance value			Temp.	Resistance value			Temp.	Resistance value		
	Max.	Typical	Min.		Max.	Typical	Min.		Max.	Typical	Min.
°C	KΩ	KΩ	KΩ	°C	KΩ	KΩ	KΩ	°C	KΩ	KΩ	KΩ
-50	344.40	329.20	314.70	1	26.64	26.13	25.52	56	3.49	3.42	3.35
-49	324.70	310.70	297.20	2	25.51	25.03	24.55	57	3.39	3.31	3.24
-48	306.40	293.30	280.70	3	24.24	23.99	23.54	58	3.28	3.21	3.14
-47	289.20	277.00	265.30	4	23.42	22.99	22.57	59	3.18	3.11	3.04
-46	273.20	261.80	250.60	5	22.45	22.05	21.66	60	3.09	3.02	2.95
-45	258.10	247.50	237.20	6	21.52	21.15	20.78	61	2.99	2.92	2.86
-44	244.00	234.10	224.60	7	20.64	20.29	19.95	62	2.90	2.83	2.77
-43	230.80	221.60	212.70	8	19.80	19.40	19.15	63	2.81	2.75	2.69
-42	218.50	209.80	201.50	9	19.00	18.70	18.40	64	2.73	2.66	2.60
-41	206.80	198.70	191.00	10	18.24	17.96	17.67	65	2.65	2.58	2.52
-40	195.90	188.40	181.10	11	17.51	17.24	16.97	66	2.57	2.51	2.45
-39	185.40	178.30	171.59	12	16.80	16.55	16.31	67	2.49	2.43	2.37
-38	175.50	168.90	162.00	13	16.13	15.90	15.87	68	2.42	2.36	2.30
-37	166.20	160.10	154.10	14	15.50	15.28	15.06	69	2.35	2.29	2.24
-36	157.50	151.80	140.20	15	14.89	14.68	14.48	70	2.28	2.22	2.17
-35	149.30	144.00	138.80	16	14.31	14.12	13.93	71	2.21	2.16	2.10
-34	141.60	136.60	131.80	17	13.75	13.57	13.40	72	2.15	2.10	2.04
-33	134.40	129.70	125.20	18	13.22	13.06	12.89	73	2.09	2.04	1.98
-32	127.60	123.20	118.90	19	12.72	12.56	12.41	74	2.03	1.98	1.93
-31	121.20	117.10	113.10	20	12.23	12.09	11.95	75	1.97	1.92	1.87
-30	115.10	111.30	107.50	21	11.77	11.63	11.57	76	1.92	1.87	1.82
-29	109.30	105.70	102.20	22	11.32	11.20	11.07	77	1.86	1.81	1.78
-28	103.80	100.40	97.16	23	10.90	10.78	10.60	78	1.81	1.76	1.71
-27	98.63	95.47	92.41	24	10.49	10.38	10.27	79	1.76	1.71	1.68
-26	93.75	90.80	87.93	25	10.10	10.00	9.90	80	1.71	1.66	1.62
-25	89.15	86.39	83.70	26	9.73	9.63	9.52	81	1.66	1.62	1.57
-24	84.82	82.22	79.71	27	9.38	9.28	9.18	82	1.62	1.57	1.53
-23	80.72	78.29	75.93	28	9.04	8.94	8.84	83	1.57	1.53	1.49
-22	76.85	74.58	72.36	29	8.72	8.62	8.52	84	1.53	1.49	1.44
-21	73.20	71.07	68.99	30	8.41	8.31	8.21	85	1.49	1.45	1.40
-20	69.74	67.74	65.80	31	8.11	8.01	7.91	86	1.45	1.41	1.37
-19	66.42	64.54	62.72	32	7.82	7.72	7.62	87	1.41	1.37	1.33
-18	63.27	61.52	59.81	33	7.55	7.45	7.35	88	1.37	1.33	1.29
-17	60.30	58.66	57.05	34	7.28	7.19	7.09	89	1.34	1.30	1.26
-16	57.49	53.39	51.97	35	7.03	6.94	6.84	90	1.30	1.26	1.22
-15	54.83	53.39	51.97	36	6.79	6.69	6.60	91	1.27	1.23	1.19
-14	52.31	50.96	49.83	37	6.56	6.46	6.37	92	1.23	1.20	1.16
-13	49.93	48.65	47.12	38	6.33	6.24	6.15	93	1.20	1.16	1.13
-12	47.67	46.48	45.31	39	6.12	6.03	5.94	94	1.17	1.13	1.10
-11	45.53	44.41	43.32	40	5.92	5.82	5.73	95	1.14	1.10	1.07
-10	43.50	42.25	41.43	41	5.72	5.63	5.54	96	1.11	1.08	1.04
-9	41.54	40.56	39.59	42	5.53	5.43	5.35	97	1.08	1.05	1.01
-8	39.68	38.76	37.85	43	5.34	5.25	5.17	98	1.05	1.02	0.99
-7	37.91	37.05	36.20	44	5.16	5.08	4.99	99	1.03	0.99	0.96
-6	36.24	35.43	34.02	45	4.99	4.91	4.82	100	1.00	0.97	0.94
-5	34.65	33.89	33.14	46	4.83	4.74	4.66	101	0.98	0.94	0.91
-4	33.14	32.43	31.73	47	4.67	4.59	4.51	102	0.95	0.92	0.89
-3	31.71	31.04	30.39	48	4.52	4.44	4.36	103	0.93	0.90	0.87
-2	30.35	29.72	29.11	49	4.38	4.30	4.22	104	0.91	0.87	0.84
-1	30.00	28.47	27.89	50	4.24	4.16	4.08	105	0.88	0.85	0.82
0	27.83	27.28	26.74	51	4.10	4.02	3.95	106	0.86	0.83	0.80
				52	3.97	3.90	3.82	107	0.84	0.81	0.78
				53	3.84	3.77	3.69	108	0.82	0.79	0.76
				54	3.72	3.65	3.57	109	0.80	0.77	0.74
				55	3.61	3.53	3.46	110	0.78	0.75	0.73

COMPRESSOR DISCHARGE PROBE

R (0) = 100,00 Ω

α = 0,003 850 1/°C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
-200	18,49											-200
-190	22,80	22,37	21,94	21,51	21,08	20,65	20,22	19,79	19,36	18,93	18,49	-190
-180	27,08	26,65	26,23	25,80	25,37	24,94	24,52	24,09	23,66	23,23	22,80	-180
-170	31,32	30,90	30,47	30,05	29,63	29,20	28,78	28,35	27,93	27,50	27,08	-170
-160	35,53	35,11	34,69	34,27	33,85	33,43	33,01	32,59	32,16	31,74	31,32	-160
-150	39,71	39,30	38,88	38,46	38,04	37,63	37,21	36,79	36,37	35,95	35,53	-150
-140	43,87	43,45	43,04	42,63	42,21	41,79	41,38	40,96	40,55	40,13	39,71	-140
-130	48,00	47,59	47,18	46,76	46,35	45,94	45,52	45,11	44,70	44,28	43,87	-130
-120	52,11	51,70	51,29	50,88	50,47	50,06	49,64	49,23	48,82	48,41	48,00	-120
-110	56,19	55,78	55,38	54,97	54,56	54,15	53,74	53,33	52,92	52,52	52,11	-110
-100	60,25	59,85	59,44	59,04	58,63	58,22	57,82	57,41	57,00	56,60	56,19	-100
-90	64,30	63,90	63,49	63,09	62,68	62,28	61,87	61,47	61,06	60,66	60,25	-90
-80	68,33	67,92	67,52	67,12	66,72	66,31	65,91	65,51	65,11	64,70	64,30	-80
-70	72,33	71,93	71,53	71,13	70,73	70,33	69,93	69,53	69,13	68,73	68,33	-70
-60	76,33	75,93	75,53	75,13	74,73	74,33	73,93	73,53	73,13	72,73	72,33	-60
-50	80,31	79,91	79,51	79,11	78,72	78,32	77,92	77,52	77,13	76,73	76,33	-50
-40	84,27	83,88	83,48	83,08	82,69	82,29	81,89	81,50	81,10	80,70	80,31	-40
-30	88,22	87,83	87,43	87,04	86,64	86,25	85,85	85,46	85,06	84,67	84,27	-30
-20	92,16	91,77	91,37	90,98	90,59	90,19	89,80	89,40	89,01	88,62	88,22	-20
-10	96,09	95,69	95,30	94,91	94,52	94,12	93,73	93,34	92,95	92,55	92,16	-10
0	100,00	99,61	99,22	98,83	98,44	98,04	97,65	97,26	96,87	96,48	96,09	0
0	100,00	100,390	100,78	101,17	101,56	101,95	102,34	102,73	103,12	103,51	103,90	0
10	103,90	104,29	104,68	105,07	105,46	105,85	106,24	106,63	107,02	107,40	107,79	10
20	107,79	108,18	108,57	108,96	109,35	109,73	110,12	110,51	110,90	111,28	111,67	20
30	111,67	112,06	112,45	112,83	113,22	113,61	113,99	114,38	114,77	115,15	115,54	30
40	115,54	115,93	116,31	116,70	117,08	117,47	117,85	118,24	118,62	119,01	119,40	40
50	119,40	119,78	120,16	120,55	120,93	121,32	121,70	122,09	122,47	122,86	123,24	50
60	123,24	123,62	124,01	124,39	124,77	125,16	125,54	125,92	123,31	126,69	127,07	60
70	127,07	127,45	127,84	128,22	128,60	128,98	129,37	129,75	130,13	130,51	130,89	70
80	130,89	131,27	131,66	132,04	132,42	132,80	133,18	133,56	133,94	134,32	134,70	80
90	134,70	135,08	135,46	135,84	136,22	136,60	136,98	137,36	137,74	138,12	138,50	90
100	138,50	138,88	139,26	139,64	140,02	140,39	140,77	141,15	141,53	141,91	142,29	100
110	142,29	142,66	143,04	143,42	143,80	144,17	144,55	144,93	145,31	145,68	146,06	110
120	146,06	146,44	146,81	147,19	147,57	147,94	148,32	148,70	149,07	149,45	149,82	120
130	149,82	150,20	150,57	150,95	151,33	151,70	152,08	152,45	152,83	153,20	153,58	130
140	153,58	153,95	154,32	154,70	155,07	155,45	155,82	156,19	156,57	156,94	157,31	140
150	157,31	157,69	158,06	158,43	158,81	159,18	159,55	159,93	160,30	160,67	161,04	150
160	161,04	161,42	161,79	162,16	162,53	162,90	163,27	163,65	164,02	164,39	164,76	160
170	164,76	165,13	165,50	165,87	166,24	166,61	166,98	167,35	167,72	168,09	168,46	170
180	168,46	168,83	169,20	169,57	169,94	170,31	170,68	171,05	171,42	171,79	172,16	180
190	172,16	172,53	172,90	173,26	173,63	174,00	174,37	174,74	175,10	175,47	175,84	190
200	175,84	176,21	176,57	176,94	177,31	177,68	178,04	178,41	178,78	179,14	179,51	200
210	179,51	179,88	180,24	180,61	180,97	181,34	181,71	182,07	182,44	182,80	183,17	210
220	183,17	183,53	183,90	184,26	184,63	184,99	185,36	185,72	186,09	186,45	186,82	220
230	186,82	187,18	187,54	187,91	188,27	188,63	189,00	189,36	189,72	190,09	190,45	230
240	190,45	190,81	191,18	191,54	191,90	192,26	192,63	192,99	193,35	193,71	194,07	240
250	194,07	194,44	194,80	195,16	195,52	195,88	196,24	196,60	196,96	197,33	197,69	250
260	197,69	198,05	198,41	198,77	199,13	199,49	199,85	200,21	200,57	200,93	201,29	260
270	201,29	201,65	202,01	202,36	202,72	203,08	203,44	203,80	204,16	204,52	204,88	270
280	204,88	205,23	205,59	205,95	206,31	206,67	207,02	207,38	207,74	208,10	208,45	280
290	208,45	208,81	209,17	209,52	209,88	210,24	210,59	210,95	211,31	211,66	212,02	290
300	212,02	212,37	212,73	213,09	213,44	213,80	214,15	214,51	214,86	215,22	215,57	300
310	215,57	215,93	216,28	216,64	216,99	217,35	217,70	218,05	218,41	218,76	219,12	310
320	219,12	219,47	219,82	220,18	220,53	220,88	221,24	221,59	221,94	222,29	222,65	320

Calibration of probes & transducers

The calibration of the temperature probes and pressure transducers may become necessary and should be checked during every maintenance inspection.

The following is a list of temperature probes and their location:

- B1 – Evaporator inlet temperature probe.
- B2 – Evaporator outlet temperature probe.
- B3 – Entering chiller temperature probe (loop return).
- B4 – Compressor discharge line temperature probe.
- B5 – Ambient temperature probe.

The following is a list of pressure transducers and their location:

- B6 – Oil pressure outlet transducer. (not all models)
- B7 – High pressure refrigerant transducer.
- B8 – Low pressure refrigerant transducer. (not all models)

Calibration Procedures:

1. Use a calibrated temperature testing instrument and sample the probe temp to be calibrated in a location close to the probe.
2. Determine the amount of offset necessary (+/-) to obtain a calibration.
3. Enter the offset via the pCO control panel by entering the maintenance menu (wrench key).
4. Enter the maintenance password and scroll down arrow to the calibration screen.
5. Locate the probe (B1-5) that requires calibration. Press “enter” until the cursor is at the correct probe number.
6. Enter the offset necessary with the up or down arrow to bring the probe into calibration press “enter” until the cursor is back in upper left corner to save. (max range of offset is -9.9C to +9.9C)

*******NOTE***** The calibration is in degrees Celsius - 1*C = 1.8*F**

7. Calibration of the pressure transducers (B6-8) is the same procedure as above, use a calibrated pressure gauge (Do not use the chiller mounted gauges to calibrate the transducers).
8. Calibration of B-7 is liquid line pressure not discharge line pressure (max range of offset is -9.9 to +9.9 bar)

*******NOTE**** The calibration is in bar - 1 bar = 14.7 psi**

Warning: A temperature probe or pressure transducer that requires calibration of more than 50% of the max range or calibration more than 2-3 times per year should be replaced.

Electrical Monitor Information

- RVG
- CF1 and CF2

RVG VOLTAGE MONITOR

DESCRIPTION

Control of phase sequence, total or partial phase loss, maximum voltage and minimum voltage. Relay output with changeover contacts, normally energized. Tripping time delay for min. and max. voltage: 0.1 to 20 seconds (adjustable). Reset time delay: 0.1 to 20 seconds (adjustable) Automatic resetting as long as voltage is within set ranges.

OPERATION

Set the rated phase to phase voltage (5). The RVG trips for phase loss, incorrect phase sequence and voltage value out of the program limits.

NORMAL OPERATION

When the phases are all energized, phase sequence is correct and voltage values are within the programmed limits the green "ON" LED is constantly lighted up, the red LED's are off and the output relay is energized.

INCORRECT PHASE SEQUENCE

When the phase sequence is incorrect the green "ON" LED alternately flashes with the red LED's while the output relay is de-energized.

PHASE LOSS

When one or more phases fail to drop below 30% of the rated voltage U_e value, the green "ON" LED flashes and the output relay de-energizes. The voltage relay trips for phase loss also when there are regenerated voltages <70% of the power supply. Resetting is automatic when the voltage value returns within the "V MIN" fixed limit. Phase loss tripping is instantaneous.

OUT OF MINIMUM VOLTAGE LIMIT

When one of the voltages drops below the MIN limit (3), the relative red LED begins flashing. When the time delay (4) lapses the output relay de-energizes the red LED remains on while the green "ON" LED begins flashing. Resetting is automatic when the voltage value returns within the fixed limit value, after the reset delay (6) lapses.

OUT OF MAXIMUM VOLTAGE LIMIT

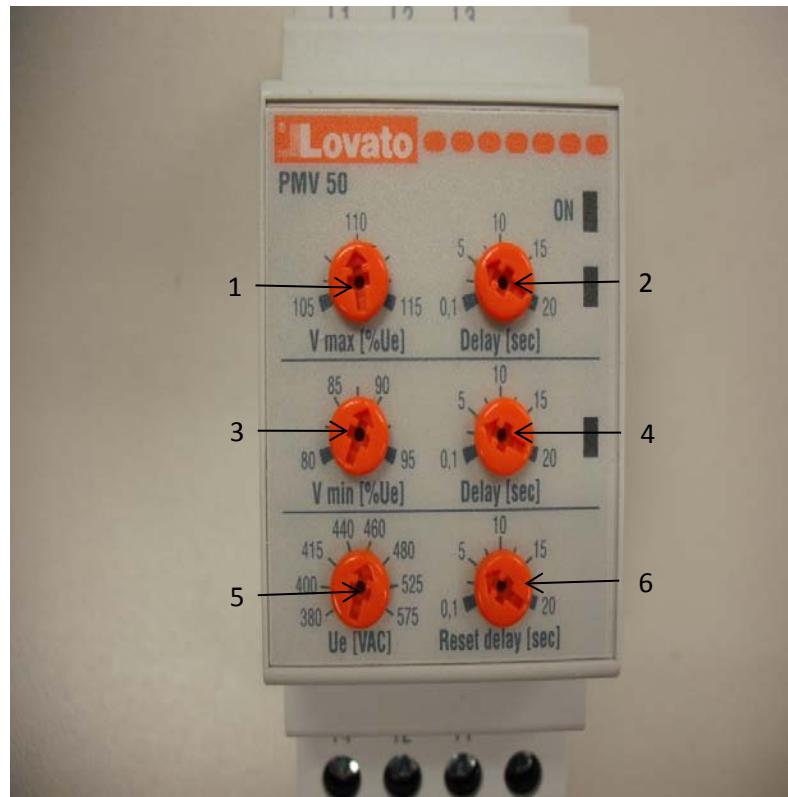
When one of the voltages exceeds the MAX limit (1), the relative red LED begins flashing. When the time delay (2) lapses the output relay de-energizes the red LED remains on while the green "ON" LED begins flashing. Resetting is automatic when the voltage value returns within the fixed limit value, after the reset delay (6) lapses.

RESET DELAY

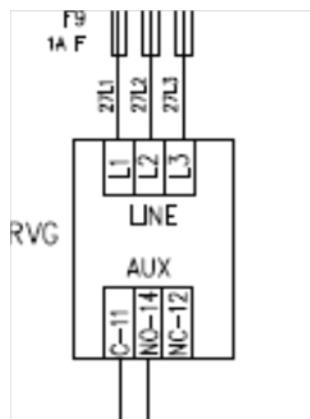
When the voltages return within the limits the red LED switches off and the green "ON" LED flashes. Once the resetting delay set with (5) lapses the output relay de-energizes while the green "ON" LED remains on.

RVG VOLTAGE MONITOR

FRONT DISPLAY OF RVG



STANDARD WIRING



CF1 and CF2 Phase Monitor

DESCRIPTION

Phase sequence and total or partial phase loss control. Resetting is automatic.

OPERATION

The voltage to control is connected to L1-L2-L3 terminals and powers the relay as well. The relay trips when phase sequence is incorrect or when one of the controlled phases fails.

NORMAL OPERATION

With all phases detected and correct phase sequence, the green ON LED is constantly switched on and the output relay is energized.

INCORRECT PHASE SEQUENCE TRIPPING

The green ON LED flashes and the output relay de-energizes when the phase sequence is not correct.

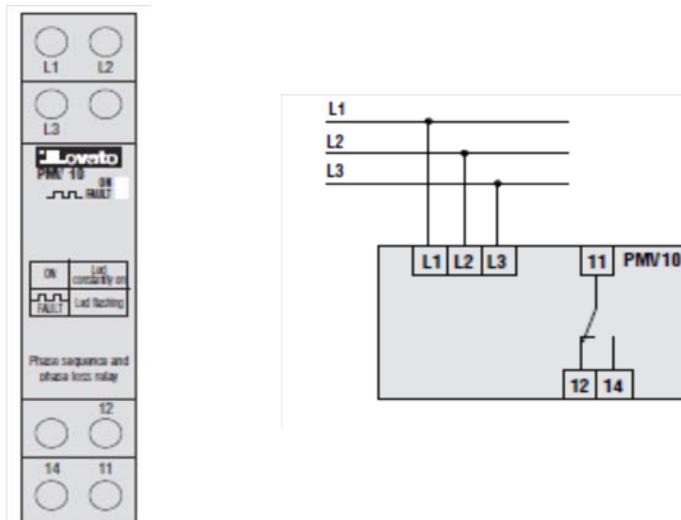
PHASE LOSS TRIPPING

The green ON LED flashes and the output relay de-energizes when one of the controlled phases fails. The relay trips for phase loss even in regenerated voltage conditions <70% controlled voltage.

PHASE LOWERING TRIPPING

When at least one of the phase-to-phase voltages falls below 70% of the other phase-to-phase voltage values, the green ON LED flashes and the output relay de-energizes. Resetting is automatic when the voltage is 5% higher than the tripping value (hysteresis).

GENERAL WIRING DIAGRAM



EEV Drive Information

EEV DRIVERS (SUPERHEAT)



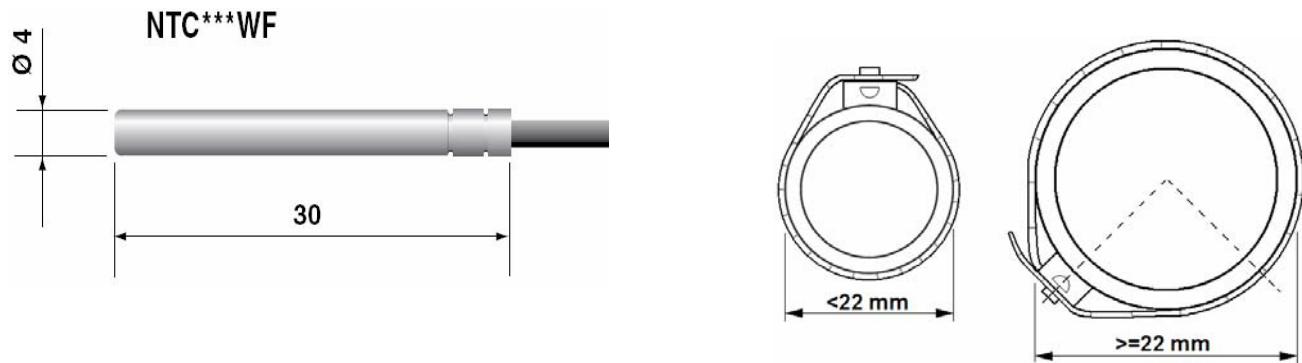
Model	EVD200
Code	EVD0000200
Software user interface	pCO controller via pLAN
Hardware user interface	5 signal LEDs
Connectable to supervisor	NO
Connectable in pLAN	YES
Control activation	From pLAN (pCO)
Type of pressure transducer	4 to 20 mA
Type of terminals	Fixed screw
Network address setting	Hardware with microswitches
Range of network addresses	1 to 31
Control as positioner	NO
Battery module	EVBAT00100

Installing the probes

The position of this probe is extremely important, as it determines the accuracy of the superheat value and the speed of response to variations in this. The probe should be installed after the evaporator outlet, in a straight and horizontal section. Comparing the section of pipe to the face of a clock, the probe must be positioned at 12 o'clock for pipes with a diameter less than 22 mm, and at 4.30 or 7.30 for pipes with a diameter greater than or equal to 22 mm.

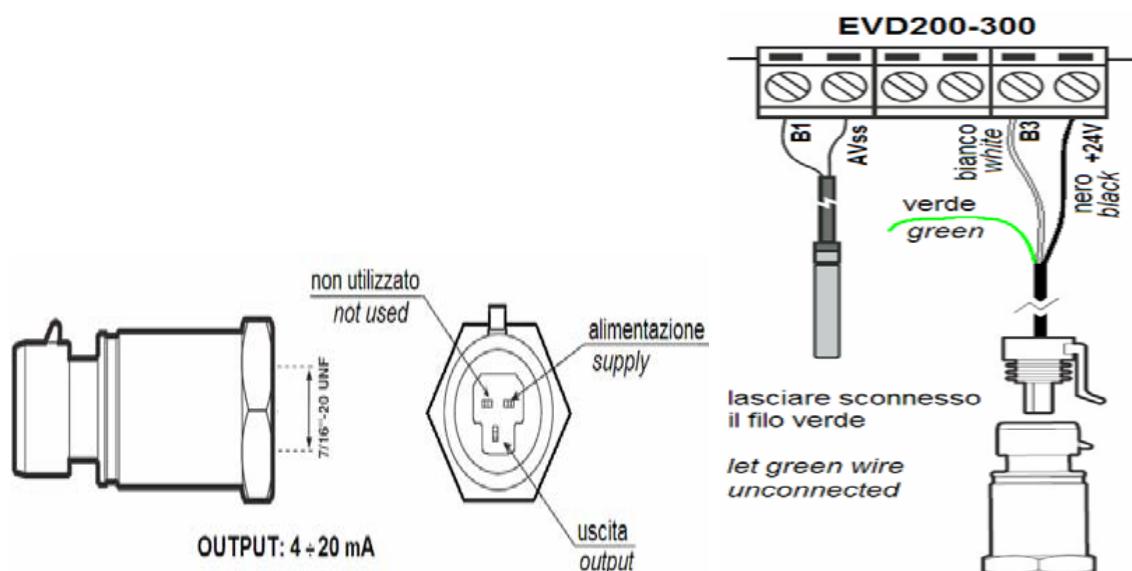
All precautions must be taken to maximize the thermal coupling between the pipe and probe, spreading conductive paste on the point of contact between the probe and the pipe, fastening the probe with a clamp. The probe cable must be looped in the immediate vicinity of the probe and then secured by elastic band; this will prevent significant variations in temperature (such as those that occur during the defrost cycles) that may damage the cable connection to the probe. Finally, the pipe-probe assembly should first be covered with aluminum tape, and then with insulating material.

No types of adhesive should be used, to avoid ruining the plastic material used to make the probe or the cable.

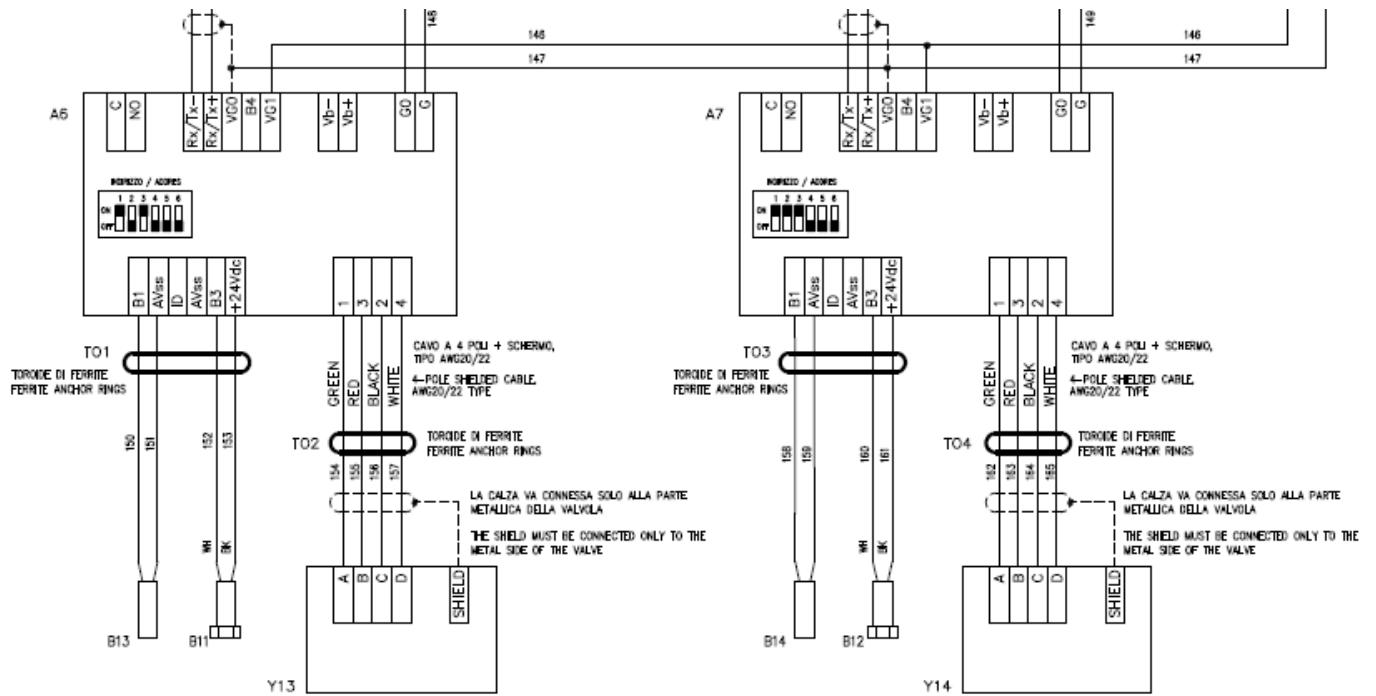


Evaporation pressure transducer

The pressure transducer must be installed near the temperature probe on the top of the pipe. It can be positioned away from the point of temperature measurement only if the section of pipe that separates the two probes does not contain devices that alter the pressure (heat exchangers, flow indicators, valves, etc.).



Probe and power supply connections



Communication Information

- Modbus
- pCo Web (Ethernet) – Bacnet

Modbus settings

1. Pco Settings - Identification No. = 1 (default) must be changed to match device ID on card:
Speed(Baud rate) = 19200
(9600 works but both baud rates must be set the same, Pco and BMS) Protocol = Modbus.
2. BMS settings: Address=1(default for polling# - not important for comm.):
3. Device ID = 1 (user may change to suit must match Ident. # in PCO):
Baud rate = 19200 (or same as Pco setting) Word Length = 8: Parity = NONE : Stop Bits = 1:
Modbus Protocol =Standard RTU (not ASCII)

Install the PCOS004850 Serial card in the serial port on the PCO (see instructions sheet with card) one card in each the Master and Slave controllers. Connect the Tx+/- :Rx+/- terminals on the card to your bus with a twisted pair IMPORTANT NOTE: connect cards one at a time from your highest device ID you choose to the lowest as all the cards default ID's and the PCO ID# are "1" (if you scan the network for ID # 1 and have multiple cards attached as # 1 you will get errors.) Example: if you have 2 chillers with a master and slave controller each you will have 4 cards and need 4 different ID#'s start with chiller # 2 and address the slave as # 4 or 14 or 24 etc... or any higher # that is not being used by another device on the bus.

Scan and locate as ID# (whatever you choose) go into the PCO parameter "Pj" and change the Ident. No. to #4 (or whatever you choose) to match, reconnect and test. Continue one at a time to the master controller on # 2 chiller and set card and ID to # 3 and so on until you have all the cards uniquely addressed.

When you are communicating with all the cards you will get a raw string of data analog I/O's and digital I/O's the scaling of the readings will be off 1 decimal place which you will need to correct for on your end. (set point reading of 450 =45.0*F) Attached with this instructions sheet is a point mapping list to help with renaming and identification of the points. If you need further assistance please contact the Motivair service dept. at (716) 691-9222.

Point Type-Function Codes Used

Coils 00001 LDI, LDO Function code 1, 5, 15

Binary Inputs 10001 LDI Function code 2

Unsigned Analog Input Register 30001 LAI Function code 4

Unsigned Holding Register 40001 LAI, LAO Function code 3, 6, 16

Above are standard modbus address schemes. I'm assuming everything in the 20000 area is a Binary Inputs 10001 LDI Function code 2

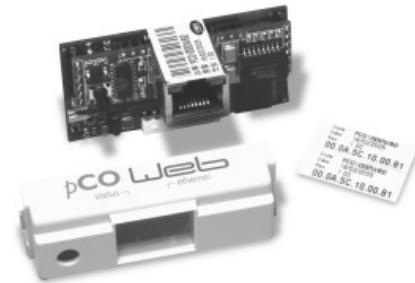
MLCFC MODBUS POINTS

RED = AVAILABLE POINTS ON SLAVE pCO CONTROL

		ACTUAL NAME	
30002	A OUT 1 Analogue input 1 value	40002 B1 Water temperature at Evaporator Inlet	10002 Chiller ON/OFF Status (keyboard)
30003	A OUT 2 Analogue input 2 value	40003 B2 Water temperature at Evaporator Outlet	10003 Relay 1 25% Comp Loaded
30004	A OUT 3 Analogue input 3 value	40004 B3 Water temperature at Freecooling Inlet (Return)	10004 Relay 2 50% Comp Loaded
30005	A OUT 4 Analogue input 4 value	40005 B4 Compressor Discharge Temperature	10005 Circulation Pump
30006	A OUT 5 Analogue input 5 value	40006 B5 Outside Air Temperature (1)	10006 Fan 1 (not Used)
30007	A OUT 6 Analogue input 6 value	40007 B6 Voltage / Current / External Set-Point (not Available)	10007 Liquid Solenoid
30008	A OUT 7 Analogue input 7 value	40008 B7 High Pressure	10008 Antifreeze Heater
30009	A OUT 8 Analogue input 8 value	40009 B8 Low Pressure (not available)	10009 Relay 3 75% Comp Loaded
30010	A OUT 9 Analogue output 1 value	40010 Y1 Fan VFD Speed (0-10V)	10010 General Alarm
30011	A OUT 10 Analogue output 2 value	40011 Y2 Free cooling valve (0-10v) Newer Models	10011 Liquid inj/Econ/Oil cooler Solenoid
30012	A IN/OUT 11 Summer temperature set-point	40012 S1 Cooling Temp Setpoint	10012 Line Contactor Comp #1
30013	A IN/OUT 12 Winter temperature set-point	40013 S1 Heating Setpoint (Heatpump Only)	10013 Triangle Contactor PWStart #2
30014	A IN/OUT 13 Condensation set-point	40014 G4 Condensing Pressure Setpoint	10014 Star Contactor (not used)
30015	A IN/OUT 14 Temperature control band	40015 P6 Cooling Setpoint Differential	10015 Freecooling ON/OFF Valve (older models)
30016	A IN/OUT 15 Double cooling temperature set point	40016 N/A	10016 D OUT 15 Enable evaporator flow-switch alarm
30017	A IN/OUT 16 Double heating temperature set point	40017 N/A	10017 D OUT 16 Enable probe 1
30018	A OUT 127 Software version	40018	10018 D OUT 17 Enable probe 2
Int-001 Unit status (0=ON 1=off alarm 2=off spvr 3=off by timer program 4=off by dig input 5=off by keyboard 6=Manual 7=Master off by Spvr 8=Master off by dig input 9=Restart 10=antifreeze heaters 11=Defrost 12=100% freecooling. 13=Antifreeze			
30130	condition + alarm	40130 condition + alarm	10019 D OUT 18 Enable probe 3
30131	I002 pLAN address of unit	40131 I002 pLAN address of unit	10020 D OUT 19 Enable probe 4
30137	I008 EEV opening steps	40137 I008 EEV opening steps	10021 D OUT 20 Enable probe 5
30139	I010 Evaporation super heat	40139 I010 Evaporation super heat	10022 D OUT 21 Enable probe 6
30140	I011 Evap. Temp. (Dew Point)	40140 I011 Evap. Temp. (Dew Point)	10023 D OUT 22 Enable probe 7
30141	I012 suction temperature	40141 I012 suction temperature	10024 D OUT 23 Enable probe 8
30147	Integer Variable 18	40147 Integer Variable 18	10025 D OUT 24 ON/OFF by supervisor
30148	Integer Variable 19	40148 Integer Variable 19	10026 D OUT 25 Enable starting restrictions
30149	Integer Variable 20	40149 Integer Variable 20	10027 D OUT 26 Type of compressor capacity control
30150	Integer Variable 21	40150 Integer Variable 21	10028 D OUT 27 Summer/Winter selection from digital input
30151	Integer Variable 22	40151 Integer Variable 22	10029 D OUT 28 Heat pump enabled
30152	Integer Variable 23	40152 Integer Variable 23	10030 D OUT 29 Summer/Winter operation
30153	Integer Variable 24	40153 Integer Variable 24	10031 D OUT 30 Selection of condensation with inverter
30154	Integer Variable 25	40154 Integer Variable 25	10032 D IN/OUT 31 Select cooling / heating
			10033 D IN/OUT 32 Reset alarms
			10034 D IN/OUT 33 Comp #1 enable
			10035 D IN/OUT 32 Comp #2 enable
			10046 D OUT 45 General alarm
			10047 D OUT 46 Antifreeze alarm
			10048 D OUT 47 Compressor thermal overload alarm
			10049 D OUT 48 Evaporator flow-switch alarm
			10050 D OUT 49 Condenser flow-switch alarm
			10051 D OUT 50 High pressure alarm from pressure switch
			10052 D OUT 51 Oil level alarm
			10053 D OUT 52 Low pressure alarm from pressure switch
			10054 D OUT 53 High pressure alarm from transducer
			10055 D OUT 54 Serious alarm from digital input
			10056 D OUT 55 Fan 1 thermal cutout alarm
			10057 D OUT 56 Fan 2 thermal cutout alarm
			10058 D OUT 57 Evaporator pump #1 thermal cutout alarm
			10059 D OUT 58 Card 1 offline alarm
			10060 D OUT 59 Slave 1 Offline alarm
			10061 D OUT 60 Slave 2 Offline alarm
			10062 D OUT 61 Slave 3 Offline alarm
			10063 D OUT 62 Alarm: Probe 1 failed or not connected
			10064 D OUT 63 Alarm: Probe 2 failed or not connected
			10065 D OUT 64 Alarm: Probe 3 failed or not connected
			10066 D OUT 65 Alarm: Probe 4 failed or not connected
			10067 D OUT 66 Alarm: Probe 5 failed or not connected
			10068 D OUT 67 Alarm: Probe 6 failed or not connected
			10069 D OUT 68 Alarm: Probe 7 failed or not connected
			10070 D OUT 69 Alarm: Probe 8 failed or not connected
			10071 D OUT 70 Condenser pump duty hours alarm
			10072 D OUT 71 Compressor duty hours alarm
			10073 D OUT 72 Condenser pump thermal cutout alarm
			10074 D OUT 73 Clock alarm
			10075 D OUT 74 Phase monitor alarm
			10076 D OUT 75 Low pressure alarm from transducer
			10077 D OUT 76 High voltage alarm
			10078 D OUT 77 High current alarm
			10079 D OUT 78 Evaporator pump 1 duty hours alarm
			10080 D OUT 79 Operation limit exceed alarm
			10081 D OUT 80 High delivery temperature alarm
			10082 D OUT 81 Pressure differential alarm
			10083 D OUT 82 Driver 1 probe alarm
			10084 D OUT 83 Alarm: driver 1 EEPROM error
			10085 D OUT 84 Alarm: driver 1 stepped motor valve error
			10086 D OUT 86 Driver 1 high pressure alarm (MOP)
			10087 D OUT 87 Driver 1 low pressure alarm (LOP)
			10088 D OUT 88 Driver 1 low superheat alarm
			10089 D OUT 89 Alarm - valve not shut after driver 1 black-out
			10090 D OUT 90 Driver 1 high intake temperature alarm
			10091 D OUT 92 Alarm: driver 2 EEPROM error
			10092 D OUT 93 Alarm: driver 2 stepped motor valve error
			10093 D OUT 94 Driver 2 probe alarm
			10094 D OUT 95 Driver 2 high pressure alarm (MOP)
			10095 D OUT 96 Driver 2 low pressure alarm (LOP)
			10096 D OUT 97 Driver 2 low superheat alarm
			10097 D OUT 98 Alarm - valve not shut after driver 2 black-out
			10098 D OUT 99 Driver 2 high intake temperature alarm
			10099 D OUT 100 Standby due to eeprom or open valve error, driver 1
			10100 D OUT 101 Standby due to eeprom or open valve error, driver 2
			10103 D102 Evap Pump 2 Overload
			10104 D103 Evap pump 2 Duty hours alarm

PCO1000W*0 - pCOWeb - Scheda di interfaccia Ethernet per pCO* / Ethernet interface board for pCO*

CAREL



Installazione /



Fig. 1



Fig. 2



Fig. 3

**LEGGI E CONSERVA
QUESTE ISTRUZIONI**
READ AND SAVE
THESE INSTRUCTIONS



Vi ringraziamo per la scelta fatta, sicuri che sarete soddisfatti del vostro acquisto.

La scheda opzionale pCOWeb (PCO1000W*0) permette l'interfacciamento di tutti i controllori della serie pCO sistema, tranne pOCB, (di seguito nominati pCO*) ad una rete Ethernet.

Il seguente foglio fa riferimento alla release software A1.2.6 – B1.1.4, leggibile tramite pagine HTML di configurazione.

Installazione

L'installazione nel pCO* si ottiene a macchina non alimentata secondo la seguente procedura:

1. togliere lo sportellino "Serial Card" del pCO* con un cacciavite (Fig. 1);
2. inserire la scheda nel corrispondente connettore a pettine, assicurandosi che sia ben inserita e a contatto dei due appoggi posti sul contenitore del pCO* (Fig. 2). Questa operazione può risultare difficoltosa a causa dello spazio esiguo, si consiglia, quindi, di inserire obliquamente la scheda e di farla poi ruotare fino a far combaciare i connettori;
3. richiudere lo sportellino, utilizzando quello in dotazione alla scheda facendo combaciare il connettore della scheda seriale con il foro presente sullo sportellino (Fig. 3);
4. (opzionale): incollare una o entrambe le etichette in dotazione all'esterno e/o all'interno del quadro elettrico in prossimità del pCO*, in modo che il MAC ADDRESS sia consultabile anche senza necessità di aprire il quadro elettrico.
5. Per la connessione alla rete Ethernet utilizzare un cavo del tipo S/FTP categoria 5e o migliore.

Connessione a rete Ethernet

La scheda pCOWeb consente di collegare il controllore pCO* ad una rete Ethernet 10 Mbps e di realizzare le seguenti funzioni:

- accesso alle informazioni del pCO* (variabili di rete e parametri) mediante un browser per Internet come Internet Explorer™ installato su un PC e collegato in rete via TCP/IP a pCOWeb (vedi Web server);
- collegamento a rete di supervisione che utilizza uno dei seguenti protocolli standard:
 - SNMP v1 & v2c; - BACnet Ethernet ISO8802-2/8802-3; - BACnet/IP (Addenda A/Annex J).

Utilizzo parametri di fabbrica

Al fine di accedere alla configurazione (si veda la sezione Configurazione), è possibile avviare pCOWeb con i seguenti valori "factory bootswitch parameters":

- IP address= 172.16.0.1; - Net mask= 255.255.0.0; - "root" user password: froot; - "httpadmin" user password: fhttpadmin;
- "carel" user password: fcarel; - "guest" user password: fguest.

Per avviare pCOWeb con questi parametri procedere come indicato di seguito:

• **da pCOWeb spenta:**

- accendere il controllore pCO* con pCOWeb già inserita e mantenere premuto il pulsantino a lungo per almeno 20 s, fino a che il LED status inizia a lampeggiare LENTAMENTE 3 volte rosso-blu;
- lasciare il tasto mentre il LED sta lampeggiando, dopo aver concluso i 3 lampeggi il LED diventa verde, quindi, per confermare il riconoscimento del tasto, il LED lampeggerà RAPIDAMENTE 3 volte rosso-blu.

Per il completo avvio di pCOWeb saranno necessari circa altri 50 s fino ad ottenere il LED Status regolarmente lampeggiante, solo da questo momento in poi sarà possibile accedere via rete a pCOWeb.

• **da pCOWeb già accessa:**

- riavviare il software di pCOWeb (vedi "Riavvio del software");
- dopo il riavvio, procedere come da pCOWeb spenta (vedi sopra).

IMPORTANTE: nella modalità "factory bootswitch parameters" pCOWeb non memorizza i parametri così richiamati ma li utilizza soltanto, per cui, al successivo riavvio senza pressione del pulsante riutilizzerà i parametri impostati dall'utente (nel caso appena acquistata, DHCP).

Riavvio del software

Per ottenere un riavvio del software da scheda a regime (cioè con LED Status regolarmente lampeggiante), tenere premuto il pulsante per un numero di secondi compresi tra 5 e 10, dopo circa 10 s dal rilascio il LED Status smetterà di lampeggiare, e dopo altri 15 il software sulla scheda si riavvierà (si veda "sequenza di avvio" sezione "Interfaccia Utente").

Configurazione

Attenzione: prima di connettere pCOWeb ad una rete Ethernet si consiglia vivamente di contattare l'amministratore di rete, in quanto una errata configurazione di pCOWeb può temporaneamente bloccare tutta la rete.

Per un corretto funzionamento di pCOWeb devono essere impostati alcuni parametri di base, quali indirizzo IP e Net mask; ogni dispositivo collegato ad una rete Ethernet, per comunicare con un host deve avere un indirizzo IP univoco.

pCOWeb viene fornito con funzionalità DHCP già attiva. Pertanto, in una rete servita da server DHCP pCOWeb, acquisirà in automatico i parametri necessari senza bisogno di configurazione, mentre, nel caso di una rete senza DHCP, è necessario configurare i parametri manualmente (vedi sezione "Accesso alla configurazione Utente...").

Accesso alla configurazione Utente (tramite rete Ethernet e pagine Web di configurazione)

Rete con DHCP: chiedere all'amministratore di rete l'indirizzo che è stato attribuito in automatico a pCOWeb già collegata, il quale avrà bisogno di conoscere il MAC ADDRESS di pCOWeb (vedi Fig. 4).

Rete senza DHCP: al primo utilizzo della scheda si consiglia di connettere direttamente pCOWeb ad un computer via cavo Ethernet utilizzando un cavo incrociato; avviare quindi la scheda con i parametri "factory bootswitch" (vedi "Tasto Pushbutton").

Per permettere al PC di accedere al pCOWeb:

- il PC utilizzato per la configurazione deve stare sulla stessa sottorete di pCOWeb; impostare i parametri di rete del PC nel seguente modo:

- IP address= **se DHCP**; chiedere all'amministratore di rete; **se con "factory bootswitch parameters"**; 172.16.xxxx (con xxxx a piacere purché diversi da 0.1 già utilizzato da pCOWeb);

- Netmask= 255.255.0.0.

• il browser sul PC deve avere l'opzione relativa all'utilizzo di un server proxy disabilitata.

Se le impostazioni di rete del PC e quelle del browser sono corrette, digitando sulla barra degli indirizzi del browser l'indirizzo IP di pCOWeb, si otterrà accesso alla home page di default di pCOWeb. Entrare quindi nell'area riservata all'amministratore utilizzando l'apposito link (Go to Administrator Area) e il seguente account preimpostato: - username= admin; - password= fadmin.

I parametri di base per la comunicazione e gli accessi si trovano nell'area "Configurazione". Scegliere "Network": sarà possibile impostare l'indirizzo IP primario della scheda e tre alias.

Per configurare la funzionalità DHCP scrivere "DHCP" al posto dell'IP address. Se la rete non utilizza DHCP, chiedere all'amministratore di rete un indirizzo IP ed una Net mask validi per la rete locale a cui il pCO* andrà collegato.



GB Thank you for having chosen this product. We trust you will be satisfied with your purchase.

The optional pCOWeb board (PCO1000W*0) is used to interface all of the pCO sistema series controllers (hereinafter pCO*), except for the pOC, to an Ethernet network.

The following sheet refers to software release A1.2.6 – B1.1.4, as read on the HTML configuration pages.

Installation

The board is installed in the pCO* controller, when off, as follows:

1. remove the "Serial Card" cover from the pCO* using a screwdriver (Fig. 1);
2. insert the board in the corresponding plug-in connector, making sure it is fully inserted and in contact with the two supports located on the case of the pCO* (Fig. 2). This operation may be difficult due to the limited space, consequently, it is recommended to insert the board at an angle and then turn it until aligning the connectors;
3. close the cover again, using the cover supplied with the board, lining up the connector on the serial board with the opening in the cover (Fig. 3);
4. (optional): stick one or both labels supplied outside and/or inside the electrical panel near the pCO*, so that the MAC ADDRESS can be read without needing to open the electrical panel;
5. for the connection to the Ethernet network, use an S/FTP cable, category 5e or higher.

Connection to the Ethernet network

The pCOWeb board is used to connect the pCO* controller to a 10 Mbps Ethernet network and consequently perform the following functions:

- access the information on the pCO* (network variables and parameters) using an Internet browser, such as Internet Explorer™ installed on a PC and connected to the pCOWeb via TCP/IP (see Web server);
- connection to a supervisory network that uses one of the following standard protocols:
 - SNMP v1 & v2c; - BACnet Ethernet ISO8802-2/8802-3; - BACnet/IP (Addenda A/Annex J).

Using the default parameters

In order to access the configuration (see the Configuration section), the pCOWeb can be started using the "factory bootswitch parameters":

- IP address= 172.16.0.1; - Net mask= 255.255.0.0; - "root" user password: froot; - "httpadmin" user password: fhttpadmin;
- "carel" user password: fcarel; - "guest" user password: fguest.

To start the pCOWeb with these parameters, proceed as follows:

- **when the pCOWeb is off:**
 - switch on the pCO* controller with the pCOWeb already inserted and hold the button for at least 20 s, until the status LED starts flashing SLOWLY 3 times, red-dark;
 - release the button while the LED is flashing, after having flashed 3 times the LED turns green, then, to confirm the recognition of the button, the LED will flash QUICKLY 3 times, red-dark.

To complete the pCOWeb boot phase, wait around another 50 s until the status LED flashes regularly; from this moment on the pCOWeb can be accessed via the network.
- **when the pCOWeb is already on:**
 - restart the pCOWeb software (see "Restarting the software");
 - after restarting, proceed as above for when the pCOWeb is off (see above).

IMPORTANT: in "factory bootswitch parameters" mode, the pCOWeb does not save the parameters recalled, but simply uses them, and therefore, when next restarted without pressing the button, it will use the parameters set by the user (if just acquired, with DHCP).

Restarting the software

To restart the software when the board is in stable operation (that is, with the status LED flashing regularly), press and hold the button for between 5 and 10 seconds; after around 10 s from releasing the button, the status LED will stop flashing, and after a further 15 seconds the software on the board will restart (see "Starting sequence", "User interface" section).

Configuration

Important: before connecting the pCOWeb to an Ethernet network, it is strongly recommended to contact the network administrator, as the incorrect configuration of the pCOWeb may temporarily shutdown the entire network.

For the correct operation of the pCOWeb, a number of basic parameters need to be set, such as the IP address and Netmask, each device connected to an Ethernet network, to communicate with a host, must have a unique IP address.

pCOWeb is supplied with the DHCP function already active. Therefore, in a network served by a DHCP server, pCOWeb will automatically acquire the necessary parameters without requiring configuration, while, in the case of a network without DHCP, the parameters need to be configured manually (see the "Accessing the user configuration..." section).

Accessing the user configuration (via Ethernet network and configuration web pages)

Automatic network configuration (DHCP): ask the network administrator for the address that has automatically been assigned to the pCOWeb already connected; the administrator will need to know the MAC ADDRESS of the pCOWeb (see Fig. 4).

Network without DHCP: when first using the board, it is recommended to connect pCOWeb directly to a computer using a crossed Ethernet cable; then start the board with the "factory bootswitch" parameters (see "Pushbutton").

- the PC used for the configuration must be in the same sub-network as the pCOWeb; set the network parameters on the PC as follows:
 - IP address= **if DHCP**; ask the network administrator; with "factory bootswitch parameters": 172.16.xxxx (with xxxx as desired, as long as different from the 0.1 already used by pCOWeb);
 - Netmask= 255.255.0.0.

- the browser on the PC must have the option corresponding to the use of a proxy server disabled.

If the network settings on the PC and the browser are correct, typing the IP address of the pCOWeb in the address bar will access the default home page of the pCOWeb. Then enter the area reserved for the administrator, using the special link (Go to Administrator Area) and the following pre-set account:

- username= admin;
- password= fadmin.

The basic parameters for communication and access are located in the "Configuration" area. Choose "Network": the primary IP address of the board and three aliases can be set.

To configure the DHCP function type "DHCP" in the place of the IP address. If the network does not use DHCP, ask the network administrator for a valid IP address and Netmask for the local network that the pCO* will be connected to.

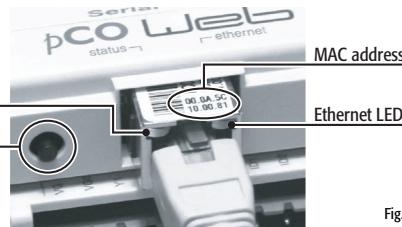


Fig. 4

II LED Status riassume lo stato della comunicazione con il controllore e mostra anche alcuni stati della scheda (Fig. 5).

- Sequenza di avvio: all'accensione o dopo un riavvio del software il LED esegue la seguente sequenza:
 - spento;
 - dopo 2 s dall'avvio: rapido lampeggi rosso-verde;
 - dopo 5 s dall'avvio: verde fisso;
 - dopo 62 s dall'avvio (scheda a regime): lampeggiante (colore lampeggi: vedi "stato della comunicazione con pCO*").
- Stato della comunicazione con pCO*: a regime il LED lampeggi per indicare la qualità della comunicazione con pCO*:
 - rapido verde-buio: comunicazione con pCO* ok (pCO* ON-LINE);
 - lento rosso-buio: comunicazione con pCO* non stabilita (pCO* OFF-LINE);
 - verde/rosso: rileva errori o temporanea mancanza di risposta da pCO*.

II LED Ethernet (Fig. 5) mostra lo stato della comunicazione con la rete Ethernet, assume i seguenti stati:

- verde: comunicazione ok, lampeggiante verde durante lo scambio di dati;
- rosso: comunicazione non stabilita (cavo interrotto, problemi dell'altro capo del cavo).

Nota: il colore rosso di questo LED non dipende dalla corretta impostazione dei parametri di comunicazione di pCOWeb, ma solo da problemi di connessione elettrica o di non rilevamento dei segnali di collegamento alla rete, quest'ultimo caso potrebbe essere dovuto al dispositivo all'altro capo del cavo che potrebbe essere spento o non collegato.

Tasto Pushbutton (Fig. 5), la cui pressione svolge la funzione di Riavvio del software o di Utilizzo parametri di fabbrica ("factory bootswitch parameters").

The Status LED shows the status of communication with the controller, as well as the status of the board (Fig. 5).

- Starting sequence: on power-up or after restarting the software, the LED performs the following sequences:

- off;
- 2 s after starting: quick red-green flash;
- 5 s after starting: green steady;
- 62 s after starting (board operating): flashing (colour: see "status of communication with the pCO*").
- Status of communication with the pCO*: in stable operation, the LED flashes to indicate the quality of communication with the pCO*:
 - fast green-dark: communication with pCO* ok (pCO* ON-LINE);
 - slow red-dark: communication with pCO* not established (pCO* OFF-LINE);
 - green/red: temporary errors, lack of response from pCO*.

The Ethernet LED (Fig. 5) shows the status of communication with the Ethernet network, with the following possibilities:

- green: communication ok, flashing green when exchanging data;
- red: communication not established (cable broken, problems at the other end of the cable).

Note: the fact that this LED may be red does not depend on the correct setting of the pCOWeb communication parameters, but only on electrical problems or the failure to read to the network connection signals; the latter case may be due to the device at the other end of the cable, which may be off or disconnected.

Pushbutton (Fig. 5); pressing this restarts the software or loads the manufacturer parameters ("factory bootswitch parameters").

Note: i parametri richiamabili con il tasto "Pushbutton" non possono essere modificati e non devono essere confusi con quelli modificabili da utente. Per una completa descrizione di tutti i parametri impostabili si rimanda al manuale per l'utente che trovate nel sito www.ksa.carel.com sezione "Download/Support/SoftwareUtilities", dove si potranno anche scaricare aggiornamenti software.

Web server

Il Web server integrato in pCOWeb è "httpd", è conforme alle specifiche HTTP 1.1 e permette di visualizzare pagine HTML direttamente sul vostro browser Internet. Una applicazione client può quindi controllare e monitorare da remoto il controllore pCO* su cui la scheda pCOWeb è installata.

Le pagine HTML possono essere facilmente realizzate e scaricate in pCOWeb dall'utente finale utilizzando un qualsiasi client FTP. Si possono utilizzare programmi di ampia diffusione sia per creare le proprie pagine HTML (es. Macromedia® DreamWeaver™ o Microsoft® FrontPage™) sia per scaricarle sul pCOWeb (es. SmartFTP™ (www.smartftp.com)).

Accesso al sistema operativo tramite autenticazione

È possibile accedere al sistema tramite terminale telnet o via FTP. Ad ogni accesso viene richiesto di autenticarsi con nome utente e password.

Gli utenti registrati sono i seguenti:

nome utente	descrizione	password di factory	permessi
root	amministratore del sistema operativo	froot	nessuna limitazione
httpadmin	amministratore web	fhttpadmin	accesso alla directory http in lettura/scrittura; ogni altra directory solo in lettura.
carel	usato da pCO* controller	fcarel	accesso solo ai servizi pCO*
guest	guest	fguest	

Le password possono essere modificate tramite l'accesso alla pagina dell'amministratore. **Nota:** le password richiamabili con il tasto "Pushbutton" non verranno modificate e non devono essere confuse con quelle modificabili da utente. Da questa pagina è inoltre possibile impostare restrizioni di accesso a ciascuna delle varie directory presenti nell'albero http.

Collegandosi quindi via FTP e autenticandosi come amministratore web nel seguente modo:

- username= httpadmin;
- password= fhttpadmin (nota "f" come "factory" come prima lettera).

si avrà accesso al file system utente di pCOWeb. Le pagine personalizzate vanno inserite nella seguente cartella: /usr/local/root/flash/http.

IMPORTANTE: Le pagine scaricate nel pCOWeb devono avere i corretti proprietari e permessi per poter essere visualizzate con un browser, impostare in modo corretto tali attributi via FTP risulta difficoltoso, per questo è disponibile la funzione di "auto-settaggio degli attributi" all'interno delle pagine dell'amministratore e per attivarla è sufficiente cliccare sul link "Adjust HTML pages attributes", si consiglia di farlo ogni volta che si modifica una o più pagine HTML.

Script CGI

È possibile realizzare script cgi con il linguaggio bash o con linguaggi compilati. Essi devono avere estensione .cgi e devono risiedere nella cartella http/usr-cgi. Come le pagine html, anche questi files devono avere correttamente settati proprietari e permessi. **IMPORTANTE:** si consiglia di cliccare sul link "Adjust HTML pages attributes" ogni volta che si modifica uno o più script.cgi.

SNMP

pCOWeb è in grado di comunicare utilizzando il protocollo SNMP (v1 & v2c). Si comporta quindi da gateway tra il protocollo proprietario CAREL e SNMP. Le informazioni disponibili via SNMP sono tutte quelle inviate in supervisione dall'applicativo caricato sul pCO*.

I files MIB per pCOWeb relativi agli applicativi standard per pCO* si possono richiedere a CAREL, quelli relativi ad applicativi non CAREL possono essere realizzati dal cliente partendo ad esempio da quelli relativi agli applicativi standard CAREL.

pCOWeb gestisce alcune trap standard e permette di definire una trap per ciascuna variabile digitale del pCO*.

L'impostazione dei parametri relativi alla gestione del protocollo BACnet si effettua attraverso le pagine di configurazione di Amministratore (vedi Accesso alla Configurazione Utente).

BACnet

pCOWeb è in grado di comunicare utilizzando il protocollo BACnet sui media Ethernet: - ISO8802-2 over 8802-3; - BACnet/IP.

pCOWeb si comporta quindi da gateway tra il protocollo proprietario CAREL e BACnet. Le informazioni trasferite sono tutte quelle inviate in supervisione dall'applicativo caricato sul pCO*.

L'impostazione dei parametri relativi alla gestione del protocollo BACnet si effettua attraverso le pagine di configurazione di Amministratore (vedi Accesso alla Configurazione Utente).

Caratteristiche generali

Condizioni di funzionamento: 0T55 °C, 20/80% U.R. non condensante;

Condizioni di immagazzinamento: -20/70 °C, 20/80% U.R. non condensante;

Grado di inquinamento ambientale: normale;

Interfaccia Ethernet: connettore RJ45 per Ethernet 10BaseT; utilizzare un cavo schermato classe 5, max 100 m.

Protocolli gestiti: HTTP, FTP, SNMP v1, v2c, DHCP, DNS, BACnet Ethernet ISO8802-2/8802-3, BACnet/IP (Addenda A/Annex J).

Memoria: 16 MB RAM, 8 MB Flash (3MB disponibili per pagine web e dati utente).

CPU: ARM7 TDMI@74MHz clock

Sistema operativo: LINUX 2.4.21.

AVVERTENZE

Precauzioni nel maneggiare la scheda.

I danneggiamenti elettrici che si verificano sui componenti elettronici avvengono quasi sempre a causa delle scariche elettrostatiche indotte dall'operatore. È quindi necessario prendere adeguati accorgimenti per queste categorie di componenti, ed in particolare:

- prima di maneggiare qualsiasi componente elettronico o scheda, toccare una messa a terra (evitare il contatto con un componente non è sufficiente in quanto una scarica di 10.000 V, tensione molto facile da raggiungere con l'elettricità statica, innesca un arco di circa 1 cm);
- i materiali devono rimanere per quanto possibile all'interno delle loro confezioni originali. Se necessario, prelevare la scheda da una confezione e trasferire il prodotto in un imballo antistatico senza toccare con le mani i lati della scheda su cui sono montati i componenti elettronici;
- evitare nel modo più assoluto di utilizzare sacchetti in plastica, polistirolo o spugne non antistatiche;
- evitare nel modo più assoluto il passaggio diretto tra operatori (per evitare fenomeni di induzione elettrostatica e conseguenti scariche).

Nota: Tutti i marchi registrati sono proprietà dei rispettivi titolari.

Note: the parameters recalled with the "Pushbutton" cannot be modified and must not be confused with the values that are modifiable by the user. For a complete description of all the parameters that can be set, refer to the user manual, available at www.ksa.carel.com, "Download/Support/SoftwareUtilities", where you can also download software upgrades to be downloaded.

Web server

The web server included in the pCOWeb is "httpd", compliant with the HTTP 1.1 specifications, and is used to display HTML pages directly on the Internet browser. A client application can thus control and monitor the pCO* controller that the pCOWeb board is installed on, from a remote location.

The HTML pages can be easily created and downloaded to the pCOWeb by the end user with any FTP client. Common programs can be used to create the custom HTML pages (e.g. Macromedia® DreamWeaver™ or Microsoft® FrontPage™) and download them to the pCOWeb (e.g. SmartFTP™ (www.smartftp.com)).

Accessing the operating system by authentication

The system can be accessed via a telnet terminal or via FTP. Authentication with user name and password is required for each access. The following users are registered:

user name	description	default password	allowed
root	administrator of the operating system	froot	no limitation
httpadmin	web administrator	fhttpadmin	read/write access to the http directory; read-only to the other directories.
carel	used by pCO* controller	fcarel	access only to the pCO* services
guest	guest	fguest	

The password can be modified by accessing the administrator page. Note: the password recalled with the "Pushbutton" function will not be modified and must not be confused with the passwords that are modifiable by the user. This page can also be used to set the access restrictions for each of the various directories in the http tree.

Consequently, connecting via FTP and logging in as the web administrator, as follows:

- username= httpadmin;
- password= fhttpadmin (note "f" as in "factory" as the first letter).

will access the pCOWeb user file system. The customised pages should be saved in the following directory: /usr/local/root/flash/http.

IMPORTANT: The pages downloaded to the pCOWeb must have the correct properties and be able to be displayed with a browser; setting these attributes correctly via FTP is quite difficult, and consequently the "auto-set attributes" function is available in the administrator pages. To activate this function, simply click the "Adjust HTML pages attributes" link; it is recommended to do this whenever modifying one or more HTML pages.

CGI script

CGI scripts can be written in bash language or compiled languages. These must have the .cgi extension and must reside in the http/usr-cgi directory. As for the HTML pages, these files must also have the properties correctly set and enabled. **IMPORTANT:** it is recommended to click on the "Adjust HTML pages attributes" link whenever modifying one or more .cgi scripts.

SNMP

pCOWeb is able to communicate using the SNMP protocol (v1 & v2c). It therefore acts as a gateway between the CAREL proprietary protocol and SNMP. The information available via SNMP relates to all the data sent to the supervisor by the application loaded on the pCO*.

The MIB files for the pCOWeb corresponding to the standard pCO* applications can be requested from CAREL, while those corresponding to non-CAREL applications can be developed by the customer based, for example, on those corresponding to the standard CAREL applications.

pCOWeb manages some standard traps and allows a trap to be defined for each digital variable on the pCO*.

The parameters relating to the management of the SNMP protocol can be set using the administrator configuration pages (see Accessing the user configuration).

BACnet

pCOWeb is able to communicate using the BACnet protocol over Ethernet: - ISO8802-2 over 8802-3; - BACnet/IP.

pCOWeb thus acts as a gateway between the CAREL proprietary protocol and BACnet. The information transferred involves all the data sent to the supervisor by the application loaded on the pCO*.

The parameters relating to the management of the BACnet protocol are set using the administrator configuration pages (see Accessing the user configuration).

General characteristics

Operating conditions: 0T55 °C, 20/80% RH non-condensing;

Storage conditions: -20/70 °C, 20/80% RH non-condensing;

Degree of environmental pollution: normal;

Ethernet interface: RJ45 connector for Ethernet 10BaseT; use a class 5 shielded cable, max 100 m.

Protocols managed: HTTP, FTP, SNMP v1, v2c, DHCP, DNS, BACnet Ethernet ISO8802-2/8802-3, BACnet/IP (Addenda A/Annex J).

Memory: 16 MB RAM, 8 MB Flash (3 MB available for web pages and user data).

CPU: ARM7 TDMI@74 MHz clock

Operating system: LINUX 2.4.21.

WARNINGS

Precautions when handling the board.

The electrical damage that occurs to electronic components is almost always due to electrostatic discharges caused by the operator. Consequently, suitable precautions must be taken when handling these components, in particular:

- before handling any electronic component or board, touch an earthed object (avoiding contact with a component is not sufficient, as a 10.000 V discharge, a voltage that can easily be reached by static electricity, creates an arc of around 1 cm);
- the materials must remain as long as possible inside their original packages. If necessary, remove the board from the packing and then place the product in antistatic packaging without touching the sides of the board containing the electronic components;
- always avoid using plastic, polystyrene or non-antistatic materials;
- always avoid passing the board between operators (to avoid the phenomena of electrostatic induction and consequent discharges).

Note: All registered brands are the property of their respective owners.

CAREL si riserva la possibilità di apportare modifiche o cambiamenti ai propri prodotti senza alcun preavviso.

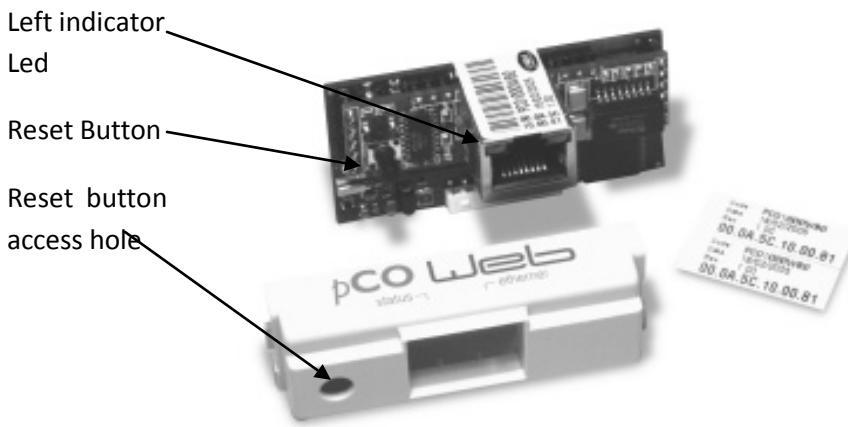
CAREL reserves the right to modify the features of its products without prior notice.

PCoWeb Start-up Instructions Cheat sheet

Control panel – create a network – LAN – TCP/IP v4 (not v6) manual connection (not DHCP) 172.16.0.2 – 255.255.0.0 (Factory default is address 172.16.0.1) with vista click control panel – click network & sharing – click manage network connections – highlight and right click lan or unspecified network – choose properties – with all other op systems click network manager.

Internet Options – Connections Tab-LAN Settings – Turn off Proxy server.

Reset Web card – power off then on the control or the chiller - hold the reset button at power up for 30 – 45 seconds until 3 red long flashes on left Led then release (see 3 fast red flashes to confirm factory boot address) wait to connect until left green light flashes 3x per sec. rt light on steady. This procedure restores the factory boot address of 172.16.0.1 so you can communicate and make you site specific changes.



Open IE Type address 172.16.0.1 – see welcome page – user = admin PW=fadmin – here you make all settings read inst.book. more help is in the book

carel protocol and 19200 speed in pCO. # 1 ID but not important.

When programming a IP address into card remember to click submit button. IP address cannot start with 0 (ie 010.555.555.2)

To access the new address (ie. 199.168.168.1) set LAN TCP/IPv4 to the same network one # higher (ie. 199.168.168.2) then access through IE with the 199.168.168.1

Command prompt “ping” then the address (172.16.0.1) to test

Set the bacnet instance ID. Send CSV file to customer.

Motivair MLCFC Bacnet/pCo IP points list

Type	Direction	Address	Description
A	OUT	1	A001 Evap Water inlet Temp
A	OUT	2	A002 Evap Water Outlet Temp
A	OUT	3	A003 Return Water Inlet Temp
A	OUT	4	A004 Comp. Discharge Line Temp
A	OUT	5	A005 Ambient Air temperature
A	OUT	6	A006 Future Oil pressure B6
A	OUT	7	A007 High pressure
A	OUT	8	A008 Low pressure
A	OUT	9	A009 VFD Fan Speed 0-10v
A	OUT	10	A010 Free cooling valve 0-10v
A	IN / OUT	11	A011 Chilled Water Set-Point
A	IN / OUT	14	A014 Differential (setpoint)
A	IN / OUT	15	2nd summer set point
A	IN / OUT	17	Adjustment of probe B1
A	IN / OUT	18	Adjustment of probe B2
A	IN / OUT	19	Adjustment of probe B5
A	OUT	20	Free cooling valve (reading of 0-10V signal)
A	IN / OUT	21	Forced opening of free cooling valve
A	OUT	86	Analogue output 3
A	OUT	127	Version of software
I	OUT	1	Unit status
I	OUT	2	pLAN address of unit
I	OUT	8	Valve position driver 1
I	OUT	9	Cooling capacity request driver 1
I	OUT	10	Actual superheat driver 1
I	OUT	11	Suction temperature driver 1
I	OUT	12	Suction temp D1
I	OUT	119	pCO type
I	OUT	120	pCO size
I	OUT	121	Bios release
I	OUT	122	Bios data
I	OUT	123	Boot release
I	OUT	124	Boot data
I	OUT	125	Software date- day
I	OUT	126	Software date- month
I	OUT	127	Software date- year
D	OUT	1	Unit status (On/Off)
D	OUT	2	Comp Loading 25% (start)
D	OUT	3	Comp Loading 50%
D	OUT	4	Water/Glycol Pump 1
D	OUT	6	LL Solenoid valve
D	OUT	8	Comp Loading 75%
D	OUT	9	General alarm Relay
D	OUT	10	Liquid Injection Valve
D	OUT	11	PW1 (Comp Contactor)

Motivair MLCFC Bacnet/pCo IP points list

D	OUT	12	PW2 (Comp Contactor)
D	OUT	14	Freecooling valve (non 0-10v valves)
D	OUT	24	ON/OFF by supervisor
D	IN / OUT	32	Reset alarms
D	IN / OUT	33	Enable compressor 1 (A9)
D	IN / OUT	34	Enable compressor 2 (A9)
D	OUT	45	General alarm
D	OUT	46	Antifreeze alarm
D	OUT	47	Compressor thermal overload alarm
D	OUT	48	Evaporator flow-switch alarm
D	OUT	50	High pressure alarm from pressure switch
D	OUT	51	Oil level alarm
D	OUT	52	Low pressure alarm from pressure switch
D	OUT	53	High pressure alarm from transducer
D	OUT	54	Serious alarm from digital input
D	OUT	55	Fan 1 thermal cutout alarm
D	OUT	57	Evaporator pump1 thermal cutout alarm
D	OUT	58	Card 1 offline alarm
D	OUT	59	Slave 1 Offline alarm
D	OUT	62	Alarm: Probe 1 failed or not connected
D	OUT	63	Alarm: Probe 2 failed or not connected
D	OUT	64	Alarm: Probe 3 failed or not connected
D	OUT	65	Alarm: Probe 4 failed or not connected
D	OUT	66	Alarm: Probe 5 failed or not connected
D	OUT	67	Alarm: Probe 6 failed or not connected
D	OUT	68	Alarm: Probe 7 failed or not connected
D	OUT	69	Alarm: Probe 8 failed or not connected
D	OUT	71	Compressor duty hours alarm
D	OUT	73	Clock alarm
D	OUT	75	Low pressure alarm from transducer
D	OUT	78	Evaporator pump1 duty hours alarm
D	OUT	80	High delivery temperature alarm
D	OUT	81	Pressure differential alarm
D	OUT	82	Driver 1 probe alarm
D	OUT	83	Alarm: driver 1 EEPROM error
D	OUT	84	Alarm: driver 1 stepped motor valve error
D	OUT	85	Low charge of driver 1 battery
D	OUT	86	Driver 1 high pressure alarm (MOP)
D	OUT	87	Driver 1 low pressure alarm (LOP)
D	OUT	88	Driver 1 low superheat alarm
D	OUT	89	Alarm - valve not shut after driver 1 black-out
D	OUT	90	Driver 1 high intake temperature alarm
D	OUT	100	Standby due to eeprom or open valve error, driver 1

Hydraulic Information

- Evaporator Flow Switch
- Free Cooling Valves
- Glycol Chart

**EVAPORATOR FLOW SWITCH
LOCATED AT THE OUTLET ON ALL MLCFC CHILLERS
SWITCH IS TESTED AND SET AT MOTIVAIR FACTORY**

Installation

IMPORTANT: All F61 Series Flow Switches are intended to control equipment under normal operating conditions. Where failure or malfunction of an F61 Flow Switch could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of the F61 Flow Switch must be incorporated into and maintained as part of the control system.

Some models of the F61 Series Standard Flow Switches require installation or adjustment of paddles prior to mounting. See *Installing the Flow Paddles*.

Parts Included

Standard models of the F61 flow switch include an installed three-piece flow paddle. Some models also include a large flow paddle for large pipe sizes.

Table 1: Replacement Parts

Kit Number	Description
KIT21A-600	Stainless Steel Three-piece Paddle (3 in., 2 in., and 1 in. Segments)
KIT21A-601	Stainless Steel 6 in. Paddle
PLT52A-600R	Stainless Steel Three-piece Paddle (3 in., 2 in., and 1 in. Segments) and 6 in. Paddle
CVR62A-600R	Replacement Cover Assembly for LB, MB, MD, and MG types

Installing the Flow Paddles

IMPORTANT: To allow the switch to detect changes in the fluid flow, the flow paddle must not touch the pipe or any restrictions in the pipe.

Adjust flow paddles to the size of the pipe used. If needed, trim the large flow paddle at the arc corresponding to pipe size (see Figure 1 and Figure 2) and install.

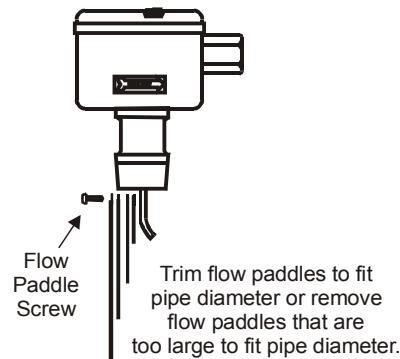


Figure 1: Installing the Paddles

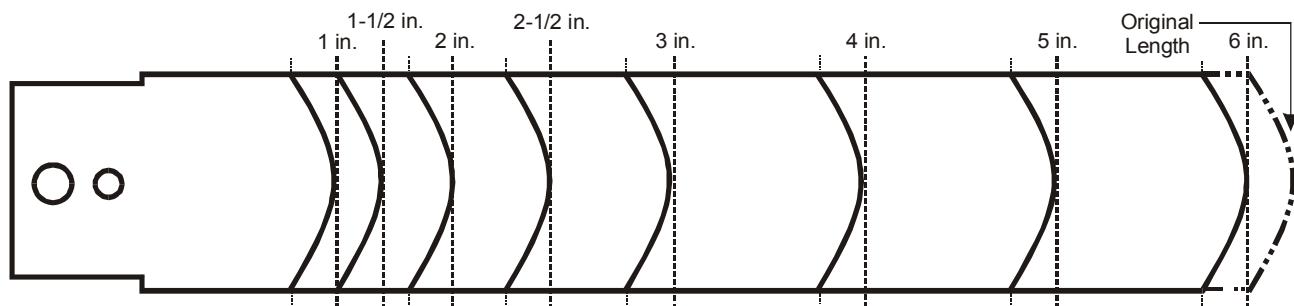


Figure 2: Trimming Diagram for Large Flow Paddle

Dimensions

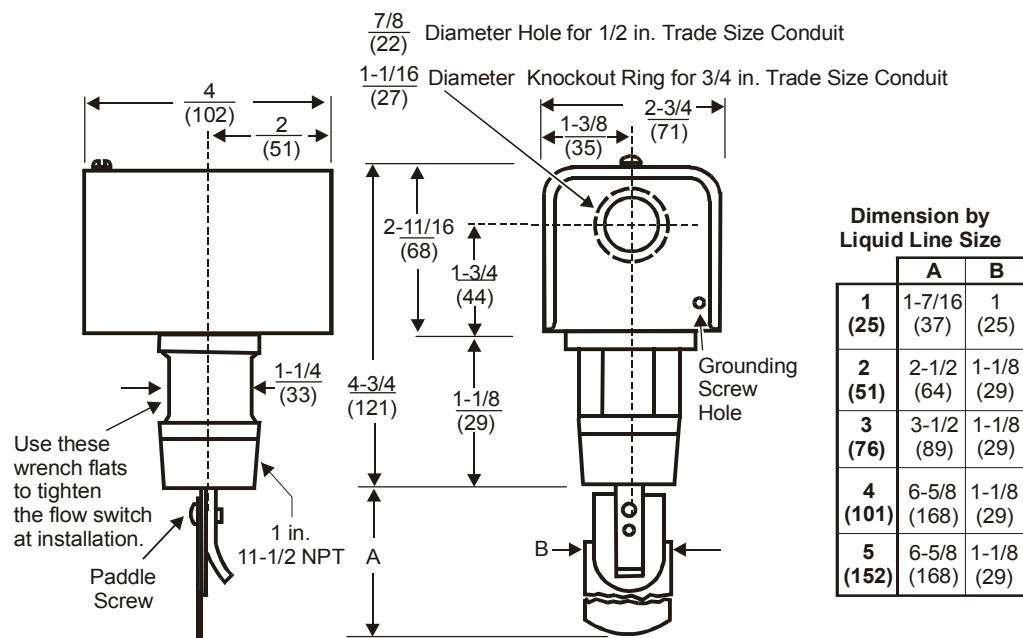


Figure 3: NEMA 1 Enclosure (F61KB Types) Dimensions, in./mm

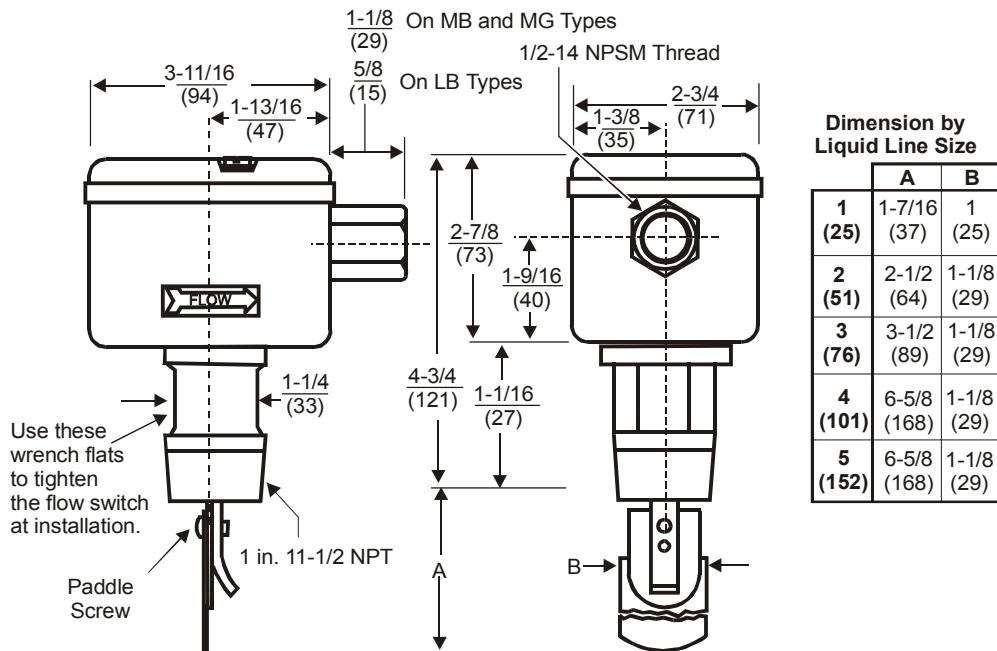


Figure 4: NEMA 3 or NEMA 3R Enclosure (F61LB, F61MB, F61MG Types) Dimensions, in./mm

Mounting



CAUTION: Risk of Equipment Damage.

To avoid damaging the switch, do not tighten the switch to the tee by grasping the switch enclosure. Use only the wrench flats provided.

Mount the F61 Series Flow Switch, using the following guidelines:

- Install the switch so that the cover and interior are accessible.
- Mount the switch so that the flow of fluid is in the direction of the arrow on the switch casing.
- Use a pipe union on each side of the flow switch to allow easy removal or replacement.
- Mount the switch so that the pipe does not extend too far into the flow switch casing.
- Use pipe thread sealer on male threads only.
- Do not remove the cover gasket or the wire grommet from the conduit opening.

For 1 in. pipe installation, mount the F61 flow switch in a standard 1 in. x 1 in. x 1 in. tee. For larger sizes of pipe, use a reducing tee to keep the flow switch close to the pipe and provide adequate paddle length in the flow stream.

Example: Use a 2 in. x 2 in. x 1 in. tee for a 2 in. pipe. If a standard 2 in. x 2 in. x 2 in. tee is used, install a face or hex bushing in the top opening to reduce it to 1 in.

Mount the flow switch so the terminals or wire leads are easily accessible for wiring. Screw the flow switch in position so the flat of the paddle is at a right angle to the flow. The arrow on the side of the case must point in the direction of the flow.

Location Considerations

Mount the F61 flow switch in a horizontal pipeline or a vertical pipeline with upward fluid flow. Do not use in a vertical pipeline with downward flow. When mounted in a vertical pipe with upward flow, the switch trips at a slightly higher flow than shown in Table 3 through Table 6, due to the effect of gravity on the switch mechanism.

Mount the F61 flow switch in a section of pipe where there is a straight run of at least five pipe diameters on each side of the flow switch from the nearest elbow, valve, or other pipe restriction. See Figure 5.

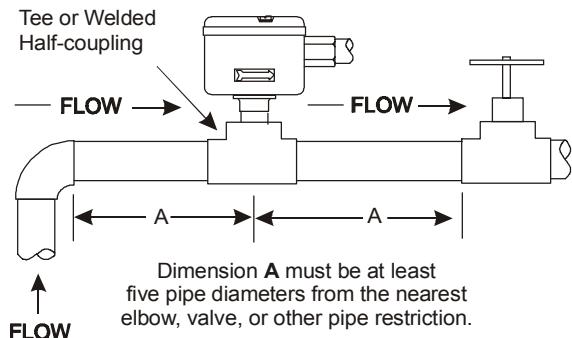


Figure 5: Required Piping Distance

Do not subject the flow switches to water hammer. Use a suitable water hammer arrester if a fast-closing valve is located downstream of the flow switch. See Figure 6.

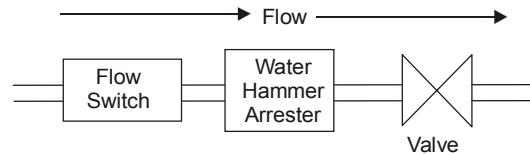


Figure 6: Water Hammer Arrester Location Schematic

Wiring



WARNING: Risk of Electrical Shock.

Disconnect power supply before making electrical connections. Failure to follow this precaution may result in electrical shock or death.



CAUTION: Risk of Equipment Damage.

Using terminal screws other than those provided will void the warranty and may damage the switch. Use only the terminal screws furnished.

IMPORTANT: To prevent moisture from entering and condensate from forming inside the NEMA 3R enclosure, do not remove the cover gasket or the wire grommet from the conduit opening.

IMPORTANT: Install all wiring in accordance with the National Electrical Code and local regulations. Make all wiring connections using copper conductors only. Do not exceed the control's electrical rating.

The F61KB and F61LB models have three color-coded terminals. Red is common. See Table 2 and Figure 1 for switch action.

The F61MB and F61MG models have four color-coded wire leads. Red is common, green is ground. See Table 2.

Table 2: Switch Action

Flow Action	Switch Closure
Increase	Red to Yellow
Decrease	Red to Blue

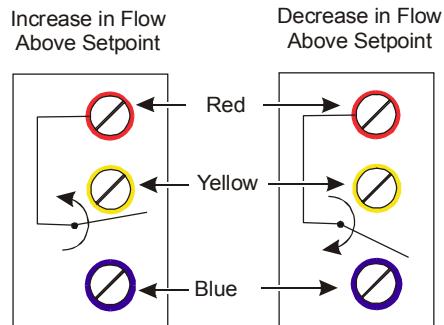


Figure 7: Switch Action

Setup and Adjustments



WARNING: Risk of Electrical Shock.

Disconnect power supply before making electrical connections. Failure to follow this precaution may result in electrical shock or death.



CAUTION: Risk of Improper Operation.

The switch is factory set at approximately the minimum flow rate (see Table 3 through Table 6). Do not set lower than the factory setting because that may result in the switch failing to return to a **no flow** position.



CAUTION: Risk of Equipment Damage.

Sealed settings (screws marked with black paint) are not intended to be changed. Adjustment attempts may damage the control or cause loss of calibration, voiding the warranty.

To adjust the setting of the flow switch:

1. Disconnect power supply before making electrical connections.
2. Remove the F61 flow switch cover.
3. Turn the adjusting screw **clockwise** to **raise** the flow rate. Turn the adjusting screw **counterclockwise** to **lower** the flow rate. See Figure 8.
4. Replace the cover after completing adjustments. Tighten the cover screws to 12 in-lbs of torque.

Note: Do not lower the flow rate unless it has been raised from the factory setting.

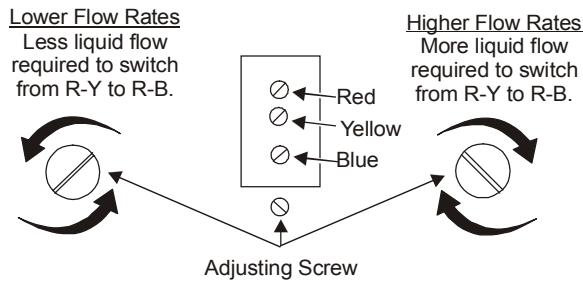


Figure 8: Flow Rate Adjustment

To verify that the flow rate is set above the factory minimum (see Figure 9):

1. depress the main lever numerous times. If the lever fails to click upon return at any time, the flow rate is set below the factory-set minimum.
2. raise the flow rate to approximately the factory minimum by turning the adjusting screw clockwise until the lever clicks upon return every time.

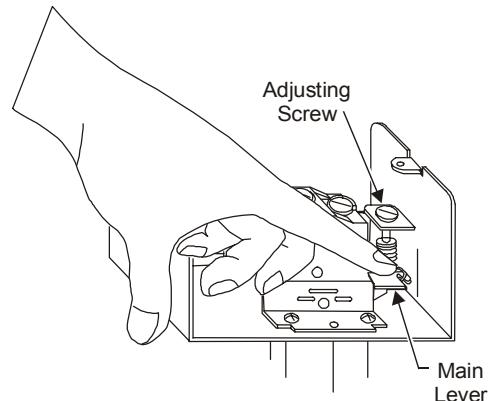


Figure 9: Minimum Adjustment

Typical Flow Rates for Standard F61 Flow Switches

Table 3: F61KB, F61LB, and F61MB Models, 1-3 in. Paddles

Pipe Size (in.)		GPM (m ³ /hr) Required to Actuate Switch									
		1	1-1/4 ¹	1-1/2 ¹	2	2-1/2 ²	3	4 ³	5 ³	6 ³	8 ³
Minimum Adjustment	Flow Increase (R to Y Closes)	4.20 (0.95)	5.80 (1.32)	7.50 (1.70)	13.7 (3.11)	18.0 (4.09)	27.5 (6.24)	65.0 (14.8)	125 (28.4)	190 (43.2)	375 (85.2)
	Flow Decrease (R to B Closes)	2.50 (0.57)	3.70 (0.84)	5.00 (1.14)	9.50 (2.16)	12.5 (2.84)	19.0 (4.32)	50.0 (11.4)	101 (22.9)	158 (35.9)	320 (72.7)
Maximum Adjustment	Flow Increase (R to Y Closes)	8.80 (2.0)	13.3 (3.02)	19.2 (4.36)	29.0 (6.59)	34.5 (7.84)	53.0 (12.0)	128 (29.1)	245 (55.6)	375 (85.2)	760 (173)
	Flow Decrease (R to B Closes)	8.50 (1.93)	12.5 (2.84)	18.0 (4.09)	27.0 (6.13)	32.0 (7.27)	50.0 (11.4)	122 (27.7)	235 (53.4)	360 (81.8)	730 (166)

1. Values for 2 in. paddle trimmed to fit pipe.
2. Values for 3 in. paddle trimmed to fit pipe.
3. Values calculated for factory-installed set of 1, 2, and 3 in. paddles.

Table 4: F61KB, F61LB, and F61MB Models, 6 in. Paddles*

Pipe Size (in.)		GPM (m ³ /hr) Required to Actuate Switch			
		4	5	6	8
Minimum Adjustment	Flow Increase (R to Y Closes)	37.0 (8.40)	57.0 (12.9)	74.0 (16.8)	205 (46.6)
	Flow Decrease (R to B Closes)	27.0 (6.13)	41.0 (9.31)	54.0 (12.3)	170 (38.6)
Maximum Adjustment	Flow Increase (R to Y Closes)	81.0 (18.4)	118 (26.8)	144 (32.7)	415 (94.3)
	Flow Decrease (R to B Closes)	76.0 (17.3)	111 (25.2)	135 (30.7)	400 (90.8)

* Where paddle size is larger than pipe size, values are for 6 in. paddle trimmed to fit pipe.

Table 5: F61MG Models, 1-3 in. Paddles

		GPM (m ³ /hr) Required to Actuate Switch									
Pipe Size (in.)		1	1-1/4 ¹	1-1/2 ¹	2	2-1/2 ²	3	4 ³	5 ³	6 ³	8 ³
Minimum Adjustment	Flow Increase (R to Y Closes)	3.80 (0.86)	5.30 (1.20)	6.90 (1.57)	12.7 (2.88)	16.7 (3.79)	24.3 (5.52)	61.0 (13.8)	118 (26.8)	183 (41.6)	362 (82.2)
	Flow Decrease (R to B Closes)	2.50 (0.57)	3.70 (0.84)	5.00 (1.14)	9.50 (2.16)	12.5 (2.84)	19.0 (4.32)	50.0 (11.4)	101 (22.9)	158 (35.9)	320 (72.7)
Maximum Adjustment	Flow Increase (R to Y Closes)	8.70 (1.98)	13.1 (2.98)	18.8 (4.27)	28.9 (6.56)	33.7 (7.65)	52.1 (11.8)	126 (28.6)	243 (55.2)	372 (84.5)	753 (171)
	Flow Decrease (R to B Closes)	8.50 (1.93)	12.5 (2.84)	18.0 (4.09)	27.0 (6.13)	32.0 (7.27)	50.0 (11.4)	122 (27.7)	235 (53.4)	360 (81.8)	730 (166)

1. Values for 2 in. paddle trimmed to fit pipe.
2. Values for 3 in. paddle trimmed to fit pipe.
3. Values calculated for factory-installed set of 1, 2, and 3 in. paddles.

Table 6: F61MG Models, 6 in. Paddles*

		GPM (m ³ /hr) Required to Actuate Switch			
Pipe Size (in.)		4	5	6	8
Minimum Adjustment	Flow Increase (R to Y Closes)	35.0 (7.95)	53.0 (12.0)	69.0 (15.7)	197 (44.7)
	Flow Decrease (R to B Closes)	27.0 (6.13)	41.0 (9.31)	54.0 (12.3)	170 (38.6)
Maximum Adjustment	Flow Increase (R to Y Closes)	80.0 (18.2)	116 (26.3)	142 (32.2)	412 (93.6)
	Flow Decrease (R to B Closes)	76.0 (17.3)	111 (25.2)	135 (30.7)	400 (90.8)

* Where paddle size is larger than pipe size, values are for 6 in. paddle trimmed to fit pipe.

Checkout

IMPORTANT: Ensure installation, wiring, and control settings are according to the application requirements. Refer to the controlled system's manufacturer specifications for the proper settings when adjusting these controls.

Apply power to the control and controlled equipment. Cycle the controlled system at least three times at normal operating conditions.

The circuit between the red and the yellow leads (terminals) closes when sufficient fluid flows through the pipe to trip the F61 flow switch.

Troubleshooting

Use the information in Table 7 to troubleshoot the flow switch.

Repairs and Replacement

Do not make field repairs, except for replacement of the cover and paddles. For a replacement flow switch, paddle kit or cover, contact the nearest Johnson Controls/PENN™ distributor. For more information, contact Refrigeration Application Engineering at (800) 275-5676.

Table 7: Troubleshooting

Symptom/Problem	Solution
Water (condensate) is within the enclosure.	Use a model with a NEMA 3R enclosure. If using a model with a NEMA 3R enclosure, inspect the grommet in the conduit fitting. Replace grommet if defective.
Fluid from the tank is leaking into enclosure due to bellows failure.	Replace flow switch.
Switch does not activate due to debris caught within the switch mechanism.	Clear any debris within the switch mechanism. Test the operation of switch several times for proper operation.
Control switch action is reversed.	Ensure connections follow wiring diagrams.
Control does not switch.	Check connections.
Switch fails to return to the no flow position.	Switch is set lower than the factory setting. Increase the setting. On vertical pipes, ensure that direction of flow is up. The arrow on switch must point in direction of flow (up).
Control does not switch on flow increase.	Check for cracked/broken paddle. Replace if necessary.

Electrical Ratings

Table 8: Electrical Ratings for F61KB, F61LB, and F61MB Models

Electrical Ratings	120 VAC	208 VAC	240 VAC	277 VAC
Horsepower	1	1	1	-
Full Load Amperes	16.0	8.8	8.0	-
Locked Rotor Amperes	96.0	52.8	48.0	-
Non-inductive Amperes	16.0	16.0	16.0	16.0
Pilot Duty		125 VA at 24/277 VAC		

Table 9: Electrical Ratings for F61MG Models

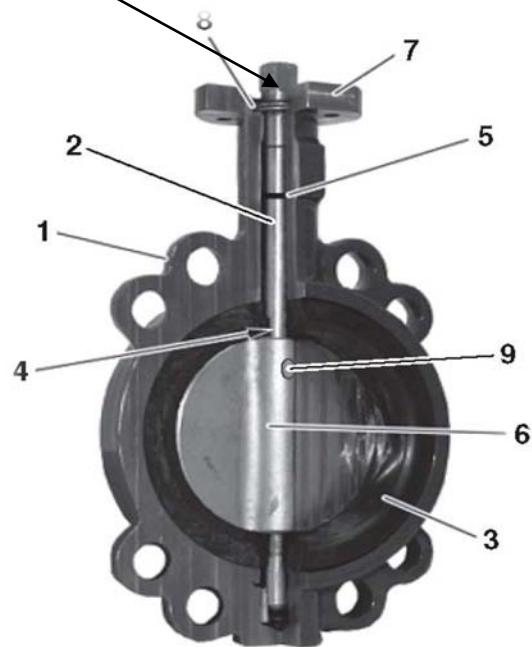
Electrical Ratings	120 VAC
Full Load Amperes	1
Locked Rotor Amperes	6
Non-inductive Amperes	2
Pilot Duty	125 VA at 24/277 VAC

Free Cooling valve service

The Motivair freecooling chillers use two styles of valves to divert the glycol to the freecooling coils. The free cooling valve and actuator shown below require periodic lubrication at the valve stem to insure continual free movement of the valve. Condensation on the stem can collect around the collar of the cover plate and oxidize.

Applying oil or a light grease to this area will keep the moisture from collecting

1. Spheroid cast iron housing
2. Stainless stem, controlled in RPTFE bush bearing
3. EPDM seat
4. EPDM seat, seals of outside
5. O-Ring, seals off outside
6. Stainless disc
7. Connection in accordance with ISO 5211
8. Stainless internal parts
9. Stainless cylindrical pin (form fit disc/stem)



Push this button for manual override



Chart PAF-2—Ethylene Glycol Performance Factors

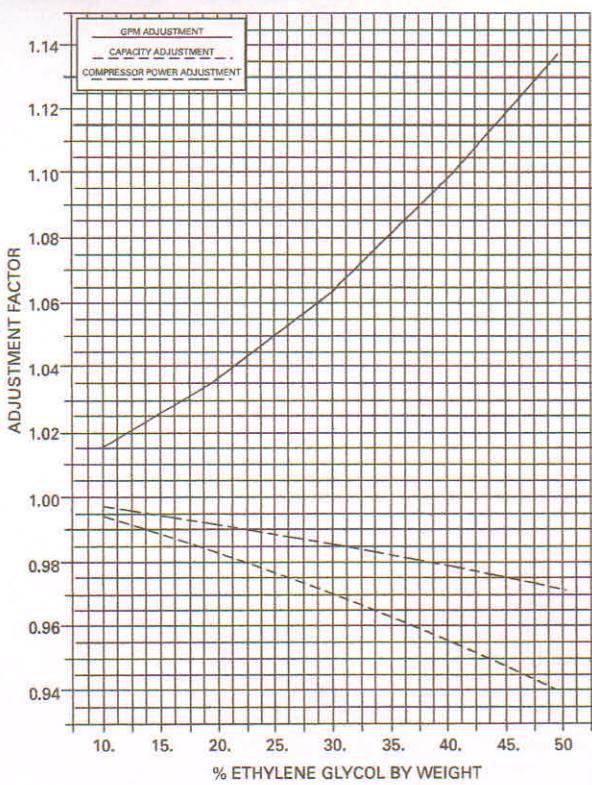


Chart PAF-3—Propylene Glycol Performance Factors

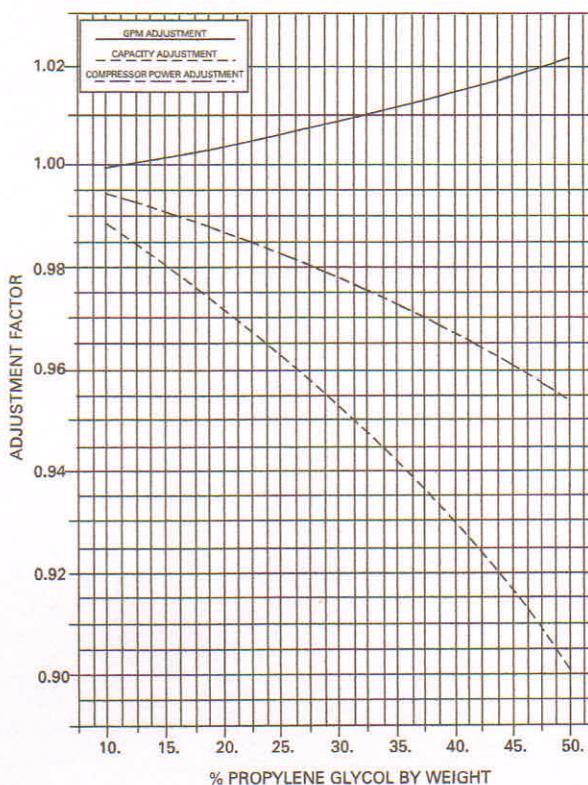


Chart PAF-4—Ethylene Glycol and Propylene Glycol Performance Factors

